APPENDIX M
Glossary

GLOSSARY

Adapted from the Traffic Control Systems Handbook, Communications Handbook for Traffic Control Systems, and Traffic Control Equipment & Software, Demonstration project 93: Participant Notebook

Arterial Analysis Executive Package (AAPEX) - General data processing package of arterial timing programs utilizing a common database that facilitates use of model as an integrated system.

Acceleration Noise - Basic variable describing quality of service. Usually considered as the disturbance of a vehicle's speed from a uniform speed.

Acceptable Gap - Time headway between successive vehicles in a traffic stream into which another vehicle is willing and able to merge.

Access Time - The time interval between the instant at which data is called from a storage device and the instant at which delivery of the data is completed.

Accident Rate - A common MOE for all traffic systems. It is expressed in terms of accidents per million vehicles (at intersections) and per 100 million vehicle miles (160 million vehicle kilometers) on freeways.

Actuated - Identifies type of control which responds to calling signals generated by action of vehicle or pedestrian. (See Semi-Actuated and Full-Actuated.)

Actuated Controller Assembly - A controller assembly for supervising the operation of traffic control signals in accordance with the varying demands of traffic as registered with the controller by traffic detectors.

Actuation - The operation of any type of detector (NEMA). The word operation means an output from the detector to the controller unit.

Adaptability - The quality of a traffic control system to maintain system operations over an extended time period under changing conditions.

Adaptive Split Control - A means of local intersection split selection based on vehicular activity.

Address - The identification of specific intersections for transmission of commands or the receipt of data.

Add-drop (multiplexer, unit) - A device connected to a TDM channel which obtains data from the channel and provides data to the channel.

Aloha - A contention technique channel *access con*trol scheme.

Addressing - (1) ***Computer*** — A method of specifying the location (address) of an operand involved in a part of an instruction. Addresses are usually numerical and specify a register, location in storage, or other data source or

destination. (See Direct Addressing, Indirect Addressing.) (2) **System** — The identification of specific intersections or locations for transmission of commands to the receipt of data. (3) **Communications** — The process of selecting a specific receiving unit on a multidrop line so that the message can be sent to that unit alone. Usually, specific control of characters precede the message enabling the selected unit to accept the data that follows.

Advance Call Detector - A detector located a considerable distance ahead of an intersection which calls the green to that approach.

Advanced Pulse or Interval Advance - A discrete command issued by the master computer which causes an on-line controlled unit to change condition, generally advancing the unit to the next position or state.

Advanced Ramp Control Warning Sign - Component of an entrance ramp control system which indicates to traffic approaching the ramp that the ramp is being metered.

Advanced Driver Information Systems (ADIS) - ADIS is a major subset of the Advanced Traveler Information Systems (ATIS) category of ITS. ADIS provides the functions of navigation information, real-time route guidance, traffic data, and yellow pages. Examples of ADIS are the TravTek and Ali-Scout systems.

Advanced Mobile Traffic Information and Communication System (AMTICS) - This Japanese project provides a wide variety of travel information including congested routes, travel time predictions, traffic regulations, railway time tables, and special events. Sponsored by National Police Agency (NPA), Ministry of Posts and Telecommunications (MPT), Japan Traffic Management and Technology Association (JSK), and private interests.

Advanced Traffic Management Systems (ATMS) - (1) The Advanced Traffic Management System category of ITS functions. Includes adaptive traffic signal control, electronic road pricing, and toll collection. (2) A microprocessor based traffic-responsive system developed by the Texas DOT. Used with success on continuous frontage roads and arterials with numerous traffic patterns. The system can chance cycle length and offset at end of the two most recent sampling periods and can alter splits each sampling period.

Advanced Transport Telematics (ATT) - The European DRIVE II program.

Advanced Traveler Information Systems (ATIS) - The Advanced Travelers Information System category of ITS functions. Includes vehicle navigation, route guidance, in-vehicle signing, intermodal travel information, trip planning, and mayday communication.

Advanced Vehicle Control Systems (AVCS) - The Advanced Vehicle Control System category of ITS. Includes intelligent cruise control, lane following, and collision avoidance.

Advanced Vehicle Control and Safety Systems - The bundle of user services that includes: Longitudinal Collision Avoidance; Lateral Collision Avoidance; Intersection Collision Avoidance; Vision Enhancement for Crash Avoidance; Pre-Crash Restraint Deployment; Safety Readiness; and Automatic Highway Systems.

Advance Warning - A per movement output used to give advance notice of an upcoming yellow or red indication. Typically used at hidden intersections with "prepare to stop" indicators.

Advisory Detector - The detection of vehicles on one or more intersection approaches solely for the purpose of modifying the phase sequence and/or length for other approaches to the intersection (NEMA).

Agreement (Contract) - The written agreement between the owner and the contractor covering the work to be performed.

Algorithm - A procedure, process, or rule for the solution of a problem in a finite number of steps. An algorithm may be a set of computational rules for the solution of a mathematically expressed problem or for evaluating a function.

Ali-Scout ADIS - A state-of-the-art ADIS system. Incorporated into the FAST-TRAC operational field test conducted in Oakland County, MI. System requires a network of communication beacons.

Allowable Gap - The time gap between successive moving vehicles at which a greater gap should terminate the green on one phase and transfer right-of-way to another phase.

All-Red Interval - The display of red indications for all entering vehicular traffic.

Alphanumeric Display - Display consisting of letters (ROAD ICY), digits, or combinations of both (ROAD ICY, SPEED 30 MPH).

Alternate - Coordination method whereby successive signal indications along an artery do not give the same indication at the same time. Single double and occasionally triple alternates are set up. Typically used in urban grid systems.

Alternating Current (AC) - A current which reverses direction at regular intervals. The rate of reversal is expressed in hertz (cycles per second).

Alternative Systems Analysis - An analysis that critically examines alternative systems with respect to system needs, life cycle costs and performance. Criteria examined include personnel and budget implications, system costs, system benefits, and performance.

American National Standards Institute (ANSI) - The national clearinghouse for coordinated, voluntary industry standards and international liaison. Focuses on data processing systems and interfaces.

American Society for Testing Materials (ASTM) - A standards organization that supports ITS by focusing on materials and traffic monitoring device interfaces.

Ampere - The unit expressing the rate of flow of an electrical current. One ampere is the current flowing through one ohm resistance with one volt pressure.

Amplifier (Detector Electronics) - A device that is capable of intensifying the electrical energy produced by a sensor. A loop detector unit is commonly called an amplifier, although its electronic function actually is different.

Amplifier (Detector) - An electrical device used to sense electrical load changes on associated sensing equipment (e.g. inductive loops) and provide an output to an intersection controller for vehicle detection.

Amplitude - The maximum value of a sine wave.

Amplitude Modulation (AM) - A method of transmitting information by varying the strength of a carrier waveform in accordance with the instantaneous value of the intelligence-bearing signal (i.e., the digital "1" and "0" levels).

Analog - An electronic design that uses continuously variable quantities such as voltages, rather than numbers.

Analog Computer System - A control system that uses an analog computer as a master. An analog computer solves problems by operating on continuous variables that represent continuous data. Problems are solved by translating physical conditions (such as numbers, volumes, time or speed) into related electrical quantities and using electrical circuits as analogs to represent the physical phenomenon. Analog techniques have been used extensively in actuated controllers and arterial systems.

Analysis of Laws and Ordinances - Analysis of applicable local laws and regulations to assess impact on system operation of motorist non-compliance.

Antenna - The radiating or receiving elements utilized intransmitting or receiving electromagnetic waves (NEMA).

Applications Software - Computer programs developed by software engineers support specific traffic tasks such as: basic detector data processing; compute signal transitions from one timing pattern to another; transmit information to controls and displays; analyze equipment operation for malfunctions; and interpret operators commands.

Approach - The remaining traffic lanes minus any exclusive turns or parking lanes.

APTS - The Advanced Public Transportation System category of ITS functions. Includes vehicle location and schedule monitoring, real-time transit, ride share, and HOV information.

Area Detection - The continuous detection of vehicles over a length of roadway wherein the call of a vehicle in the detection area is intended to be held for as long as the vehicle remains in the detection area. (Some detectors are not capable of holding the call indefinitely). Frequently referred to as *large-area detectors* or long *loop presence detectors*.

Area of Detection - See Zone of Detection.

Area Detector - See Large Area Detector

Area Radio Networks (ARN) - Also called packet radio, broadcasts signals to an area rather than a specific location. ARN can operate traffic controllers and provide mobile voice communications. Requires FCC license.

Areawide Control - A form of signal system control which treats all of the traffic signals in a city, metropolitan area, or major portion thereof as a total system.

Areawide Integrated Strategy - A strategy that selects and adjusts ramp metering rates based on corridor flow optimization. Also adjusts traffic signal timing plans as part of overall strategy.

Arithmetic Unit - An electronic unit within a computer CPU which performs arithmetic and logic operations. Most arithmetic units can process an entire word of bits in a single cycle.

Array - (1) An orderly arrangement of items or of representatives of items in a visual display (e.g., console or status panel). (2) Data in the form of signs, symbols, alphanumeric characters, etc., arranged so that the relative position of an element of an array has some bearing on the operation that will be performed on the element.

Arterial - A main street generally considered to be a thoroughfare with preferential right-of-way.

Arterial Control System (ACS) - An arterial control technique that operates as a three-level distribution microcomputer-based traffic data and control system. Consists of Local Control Units (LCU), System Control Units, and a Manager.

Arterial Intersection Control (Open Network Control) - A form of control for signalized intersections along an arterial street where major consideration is given to the provision of progressive traffic flow along the arterial. The signalized intersections usually operate as a system.

Arterial System - A linear sequence of signals on an arterial supervised to provide progressive flow in one or both travel directions.

Arterial Systems Control - A type of control applied to two or more traffic signals to ensure progressive traffic flow.

Arterial Timing Techniques - Two techniques for computing arterial timing plans are to maximize the bandwidth of progression and to minimize overall delays and stops. MAXBAND, MULTIBAND PASSER II-90, and AAPEX maximize progression. TRANSYT minimizes delays and stops.

ASCII (American Standard Code of Information Interchange) - A standard code that assigns special bit patterns to each sign, symbol, numeral, letter, and operation in a specific test. The basic code uses 6-bit characters, allowing 64 different encoded characters.

Assembler - A computer program that prepares a machine language program from symbolic instructions.

Assembly Language - A machine-dependent symbolic language which must be converted to machine language instructions for symbolic instructions.

Asynchronous - A non-synchronized condition. Free running without any specific relationship in operation to any other condition.

Asynchronous Transmission - The time intervals between transmitted characters may be of unequal length. Start and stop bits are transmitted before and after each character to synchronize the receiver clock. Most traffic systems use this transmission.

Attenuation - The loss in signal strength associated with the transmission process. Attenuation is usually expressed as the ratio of receiver signal strength to transmitted signal strength. This ratio is often expressed in decibels (dB), a logarithmic unit for expressing dimensionless ratios. For light-energy transmission the loss may result from absorption, scattering or microbends, and macrobends.

Attenuation Distortion - The distortion of a transmitted signal caused by the non-uniform loss or gain at different frequencies.

Attenuator - An electronic circuit element which reduces the strength or magnitude of a signal or action.

Audible Pedestrian Signals - Audible signal that indicates walk intervals for pedestrians.

Auto/Manual Switch - A cabinet switch, when operated, discontinues normal signal operation and permits manual operation.

Auto Restart - The integration of hardware logic and electrical circuitry with software programming capabilities enabling a computer system to be reactivated without operator intervention following a power failure.

Automated Highway Systems - This ITS user service provides a fully automated, hands off, operating environment for the motorist in his car.

Automated Roadside Safety Inspection - The ITS user service that provides and supports roadside inspections through real-time access to driver/vehicle records.

Automatic Highway Advisory Radio (AHAR) - An AHAR system automatically transfers a motorist's compatible radio to a designated station. This eliminates the need for advance signing and manual tuning. AHAR operates at 48.5 MHz (FM).

Automatic Repeat Request (ARQ) - An error detection technique that has the data automatically retransmitted.

Automatic Vehicle Identification (AVI) - Device that has three functional elements: a vehicle-mounted transponder; roadside reader unit; and processing unit.

Auxiliary Equipment - Separate devices used to add supplementary features to a controller assembly.

Auxiliary Storage - A storage device which serves as an extension to processor storage. Data and instructions can be moved by the CPU between auxiliary storage and processor storage.

Available Systems Technology - The present state-of-the-art relative to the ability to readily obtain (purchase and install) a complete traffic control system.

Avalanche Photodiode - A highly sensitive detector device used in fiber optic communication systems.

Average - (1) In coordination, the offset and cycle lengths used during periods other than peak periods.

Average Speed - A MOE expressed in miles per hour (kilometers per hour). Can be defined as either a point sample of average stream speed or the speed traces of individual vehicles.

AWG American Wire Gauge - The standard measurement of wire size. It is based on the circular mil system. 1 Mil equals.001.

Backbone - A high capacity communications system to which a number of drops are connected. The drops may service lower capacity distribution systems.

Background Cycle - The term used to identify the cycle length established by a coordination unit and master control in coordinated systems.

Background Processing - The execution of low-priority programs in conjunction with high-priority of real-time processing. Background processing is interrupted as required to accomplish the foreground (high priority) operations, in real-time. (See *Multiprocessing, Foreground,* and *Processing)*.

Back Panel - A board within the controller cabinet upon which are mounted field terminals, fuse receptacles or circuit breakers, and other portions of the controller assembly not included in the controller unit or auxiliary devices.

Backup System - A standby traffic signal control system that can be used to operate a computerized traffic signal system during computer downtime periods for routine maintenance or emergency failure periods. The backup system may be composed of components which, during normal operation, carry out other lower priority tasks or of components which are redundant during normal system operation. (See **Standby System**.)

Band (Green Band) - Through or green elapsed time between the first and last possible vehicle permitted through an intersection in a progressive coordination system.

Band Speed - The slope of the green band on a time-speed chart representing the progressive speed of traffic moving along the arterial.

Bandwidth - (1) The amount of green time available to a platoon of vehicles in a progressive signal system. Also referred to as through band. (2) A range of frequencies that a communications channel will carry without excessive attenuation. The larger the bandwidth the greater the information transfer capacity of the channel per unit time.

Barrier Line - See Compatibility Line.

Baseband - A method of communication in which a signal is transmitted at its original frequency without being impressed on a carrier.

Batch Processing - An off-line sequential-processing technique in which a number of similar input items are grouped for processing during the same machine run.

Baud - A unit for expressing the rate at which information is transmitted. A rate of one baud is one useful signal element per second. A bit rate is not necessarily equal to the baud rate in that a signal element may carry more than one bit of information, and some bits may be used for purposes other than carrying signal information.

Band Rate - The input rate of data transmission to a communications channel, usually expressed in bits per second.

Benchmark Program - (1) A program used to evaluate the performance of hardware or software or both. (2) A program used to evaluate the performance of several computers relative to each other, or a single computer relative to system specifications.

Benefit-Cost Analysis - A specific evaluation used to determine the comparative worth of alternative systems. It establishes a dollar benefit from system operation and compares that to system cost including design, installation and O & M costs.

Bid Proposal - (1) A contract document that provides instructions and the format for preparation of the proposal. (2) A written document expressing a bidder's intention to perform certain work, in a proposed method, for an expressed amount of money, usually within a certain time frame. Includes bid price and authorization to bidder.

Binary - (1) A characteristic or property involving a selection or condition in which there are two and only two possibilities. Use of a binary system is predicated on the supposition that a duality exists: that is, a thing, state or condition is or is not. (2) A numbering system based on two which only uses the digits 0 and 1.

Binary Coded Decimal - A means of representing a decimal number by representing each individual digit as a group of bits.

Bit - (1) An abbreviation of **Binary Digit**. (2) A single character in a binary number.

Bit error rate - The ratio of incorrectly transmitted bits to correctly transmitted bits.

Bit Rate (BR) - The speed at which bits are transmitted, usually expressed in bits per second.

Bits Per Inch (BPI) - Tape packing density on a tape drive. It is the number of bits on one track contained on one inch tape.

Blocking Factor - The number of data records in a data block. (Also see **Data Block**).

Bonds - The legal document that binds a third party to **make whole** the system buyer for non-compliance or default on the contract. Types of bonds: bid bond, performance bond, labor, and material payment bond.

Bootstrap - (1) An existing version, perhaps a primitive version, of a computer program that is used to establish another version of the program. (2) A technique or device designed to bring itself into a desired state by means of its own action, e.g., a machine routine whose first few instructions are sufficient to bring the rest of itself into the computer from an input device. (3) That part of a computer program used to establish another version of the computer program. (4) To use a bootstrap.

Bottleneck - Physical or geometric features of a street or freeway which reduce the facility's capacity (or ability to accommodate traffic flow) as compared to other locations on the same facility.

Breakdown - Any event that causes a loss of signal indication to any or all intervals or approaches.

Broad Band Communications - A band of communication frequencies above 4,000 Hertz, usually transmitted over coaxial cables.

Broadcast - The simultaneous transmission of a to all message receivers on the channel.

Buffer - A device or system used to make two other devices or systems compatible, in particular: (1) A device or routine that compensates for differences in time or occurrence or rates of flow when data is transmitted between devices. (2) A circuit between two other circuits to prevent undesirable interaction. A second, redundant, usually temporary, area in memory or storage for data.

Bug - An error in a computer program.

Bus Detector (Active) - Device that consists of a bus mounted RF transmitter, receiver loop in pavement, and curbside receiver unit.

Bus Detector (Passive) - Pavement installed loop detector with digital device that analyses the signal so as to identify buses.

Bus Priority - Cycle-by-cycle timing of a traffic signal so the beginning and end times of green may be shifted to minimize delay to approaching buses. The normal sequence of signal displays is usually maintained.

Bus/Carpool Priority Control - Concepts of traffic control which gives preferential treatment to buses and carpools.

Bypass Lanes on Entrance Ramps - Priority control technique which enables priority vehicles to avoid waiting in queues with nonpriority vehicles on entrance ramps.

Byte - A sequence of adjacent bits used to represent a single character of information. The most common byte sizes are 8- and 16-bits.

Cabinet - An outdoor enclosure for housing the controller unit and associated equipment.

Cable - A group of separately insulated wires wrapped together.

Cable loss - The loss or attenuation of signal power in a cable as a result of its electrical or optical properties.

CAL3QHC - An emission control computer program used by the EPA to analyze air pollution at intersections where both idle and steady motion take place.

Caline3 - An emission control computer program developed by CALTRANS. It calculates concentrations of non-reactive air pollutants near highways.

Call - A registration of a demand for right-of-way by traffic at a controller unit. The call to the controller is via detector actuation.

Calling Detector - A detector installed in a selected location to detect vehicles which may not otherwise be detected, and whose output may be modified by the controller unit. This traditionally has meant a small-area detector near the stopline, to detect vehicles entering the roadway from a nearby driveway during red or yellow interval. When the signal is green, the detector is disconnected so that extensions of the green can come only from the detector located upstream of the driveway.

Camshaft - The adjustable or selective controller device used to change signal indications upon activation by the dial unit.

Camshaft Control - A method of computerized control of an electromechanical-type controller. A hold-on-line signal puts the controller under computer control. Advanced pulses are then used to operate the stepping motor or solenoid that advances the camshaft to the next interval position. (As contrast to *Dial Control*.)

Candidate System - A complete traffic control system (defined in conceptual and functional terms) which can be considered as a feasible choice for implementation.

Capacity - The maximum volume that has a reasonable expectation of being accommodated by a roadway component under prevailing conditions, usually expressed as vehicles per hour (vph or v/hr).

Card-Rack-Mounted Detector Units - Units that do not have individual enclosures. They are connected by inserting printed-circuit boards into receptacles mounted within the cabinet. (Compare *Shelf-Mounted Detector Units*.)

Carrier - A signal comprised of a single frequency. A characteristic of this signal is changed (modulated) in accordance with the information being transmitted.

Carrier Detect - Indicates to the sender that the receiving modern has received the transmitting modem's carrier.

Carrier Frequency - A frequency that is modulated by the lower frequency ingle signals being communicated or carried, each carrier frequency provides an independent communications channel.

Carrier Sense Multiple Access - A contention technique channel access control scheme.

Carrier Signal - The signal that is used to carry information during data transmission. The characteristics of the carrier signal are changed in accordance with the data that are to be transmitted. (See also **Modulation**.)

Carryover Output - The ability of a detector to continue its output for a predetermined length of time following an actuation. Such a detector is called an extended-call detector or a *stretch* detector. It can be designed to begin timing of the carryover output when the vehicle enters the detection area, or when it leaves. The latter design is more common.

Cassette Tape Recorder - A peripheral auxiliary device that stores information on an encased magnetic tape.

Cathode Ray Tube (CRT) - An electronic vacuum tube similar to a TV picture tube containing a fluorescent screen on which information or patterns may be displayed.

CCTV Monitoring Systems - Advanced traffic management systems with continuous CCTV coverage can serve as a motorist aid system. Operators can observe incidents and dispatch aid.

CEC - Commission of European Communities.

Cellular Telephone System - Motorists with cellular telephones can call a dispatch office (or dial 911) to report a freeway accident or any other emergency.

Central Business District (CBD) - The portion of a municipality in which the dominant land use is for intense business activity.

Central Communication Unit - A unit commonly used at the traffic operations center for coordinating the operation of TDM communications with field controllers.

Central Processing Unit (CPU) - The hardware component of a computing system that contains the circuits that control and perform the execution of instructions. It consists of the control unit(s), arithmetic unit(s), and special register groups.

Centralized Control - Form of traffic signal control in which the ability to make control decisions and to issue control commands is placed at one location.

Centralized System - A computer control system in which the master computer, central communication facilities, console, keyboard, and display equipment are all situated at a single location. From this center, the operating staff coordinates and controls traffic signals and related traffic functions throughout the area. (In contrast to **Distributed System**.)

CFR Section 655.409 - The part of the FHWA Federal-Aid Policy Guide that specifies the requirements for implementation of a traffic system.

Channel Capacity - The maximum signal rate which a communication channel can sustain. It is usually measured in bits/sec.

Channel Throughput - See "channel capacity."

Changeable Message Signs (CMS) - Signs that electronically or mechanically vary the visual word, number or symbolic display as traffic conditions warrant. A dynamic sign for dynamic traffic conditions. Commonly referred to as variable message signs (VMS).

Character - One symbol of a set of elementary symbols such as those corresponding to the keys on a typewriter. These symbols usually include the decimal digits 0 to 9, letters A through Z, punctuation marks, operation symbols, and any other single symbols, which a computer may read, store, or write.

Check - An outgoing circuit that indicates the existence of an unanswered call.

Check Out - *See **Debug**.*

Check-In Detector - A vehicle presence detector placed on the approach to the ramp metering signal so that the signal changes to green only at vehicle presence.

Check-Out Detector - Component of an entrance ramp control system which sense the departure of a vehicle past the ramp metering signal. Terminates the green signal after one vehicle has passed.

Checksum - An error code where as additional byte is added at the end of the message. An algorithm computes the checksum byte as a function of the message bytes. The same algorithm is performed at the receiver and the answers are compared.

Chip - See **Integrated Circuit**.

Circuit - A closed path followed by an electric current.

Citizen Band (CB) Radio - CB radio can serve as an in-vehicle, two-way motorist air system. The system allows motorists to remain in their vehicles when requesting aid. Channel 9 (27.065 MHz) is the official emergency channel.

Clear To Send - The signal sent to the transmitting computer that both modems are ready to perform their functions and that transmission may begin.

Clearance Interval(s) - The interval(s) from the end of the right-of-way of one phase to the beginning of a conflicting phase.

Closed Grid Signal System - A network of signals forming an interlocking pattern are supervised to give progressive flow in all traveled directions within the network.

Closed Network Control - A form of control for a group of signalized intersections where relationships form a signal timing viewpoint must be considered. A typical example is the control of signals on central business district (CBD) of a city.

Closed Specification - A specification written around a particular item of material with the intent of limiting bids to one manufacturer.

Closed-Loop Control System - A system capable of controlling some operation by implementing certain strategies, receiving inputs that permit the rapid evaluation of the effects of the control, and then taking some action that modifies the strategy on the basis of the evaluation, all without the need of operator input.

Closed-Loop Distributed Processing Signal System - A system that uses one or more on-street intelligent micro-computer master controller units. Each master can select signal timing plans and implement plans by supervision of local controllers in it's subsystem.

Closed-Loop Signal System - A system that provides two-way communication between the intersection signal controller and it's master controller. The master controller communicates to the traffic operations center.

CNA (Call to Non-Actuated) - An actuated controller feature whereby the associated phase will always serve the walk plus ped clear time regardless of detector inputs. For more see: CNA in Applications Section.

Coaxial Cable (Coax) - A broadband communications technology with the capability of carrying many channels to transmit either data or video. Contains a single central conductor having a common axis with a second outer conductor.

Codec - A coder decoder. This terminology is commonly used for equipment which transmits and receives coded video information. Coding compresses the video information so that it may be transmitted over a digital channel with a lower bandwidth than would otherwise be required to carry the signal.

Code Division Multiplexing (CDM) - This technique encodes data by using e specified but different binary se-quence for each channel.

Coded TV Transmission - Video compression standards are called the P v 64 (*P by 64*). Supports data rates in multiples of 64 Kbps ranging from 64 Kbps to 2 Mbps. Proposed by Consultative Committee for International Telephone and Telegraph (CCITT).

Collision - The simultaneous transmission and reception of signals by elements of a communication system based on contention techniques.

Command - (1) A signal that initiates a control function. (2) A machine language instruction.

Commercial Fleet management - The ITS user service that provides communications between drivers, dispatchers, and intermodal transportation providers.

Commercial Radio Motorist Information Systems - Commercial radio has wide-area coverage and reaches a large segment of the motoring public. Many commercial stations schedule traffic information broadcasts at periodic intervals.

Commercial Vehicle Electronic Clearance - The ITS commercial user service that facilitates domestic and interna-tional border clearance, minimizing stops.

Commercial Vehicle Operations - The bundle of ITS user services including: commercial vehicle electronic clearance; automated roadside safety inspection; on-board safety monitoring; commercial vehicle administration process; and commercial fleet management.

Commercial Wireless Network Services - These services include cellular telephone and packet radio. Both services include monthly minimums and fee for use.

Common Carrier - One of several licensed corporations that offer data transmission services such as speech, television, or digital data transmission. A common carrier is required to supply communication services to all users at published rates.

Communications - Broad term used to denote the transmission of intelligence between two or more points separated by some distance. May be electrical impulses with specific identities or actual audible signals.

Communication Buffer - A register in a communication terminal which interfaces with a computer and provides temporary storage for data passing between these units.

Communication Channel - The logical and physical path over which information travels. The channel is described by the point-to-point path that it interconnects and the information capacity that it possesses (also communications link).

Communication Error - Any case wherein the data received from a channel does not agree with the data transmitted.

Communication Hub - A location at which data is transferred between backbone and distribution communication systems.

Communication Link - The means of connecting one location to another in order to transmit and receive data.

Communication Medium - The composition of the path along which a communications signal is propagated, such as wire pair, coaxial cable, optical fiber, or air path.

Communication Network - A composite of communication links.

Communication Overhead - That portion of the communication character stream which is provided for identification of the drop, control of symbol transmission and detection, and connection of errors.

Communication System - The composite of communication links and associated communications equipment which interconnect all the control and surveillance components of a traffic control system.

Communications - Transfer of information from one location to another so that meaning is understood.

Communications Control Unit (CCU) - The portion of a system that handles the communication processes. The CCU may be a software program or a separate hardware unit. It handles message transmission, errors, control functions, and other communication-related tasks.

Compatibility Lines - A controller reference point in the designated sequence of a dual-ring controller unit at which both rings interlock.

Compiler - A computer program that translates a high-level language program to symbolic language.

Comprehensibility - A measure of a motorist's ability to understand the message intended to be conveyed by the sign.

Computer - See *Digital Computer*.

Computer Adapter Unit - A device which allows a digital computer to interface with a local controller and thereby allow the computer to be in command of the signal indications. (See *Controller Interface Unit*).

Computer Control - Regulation and/or supervision of traffic control devices by a computer.

Computer Program - A series of instructions or statements in a form acceptable to the computer which will achieve a certain result.

Concentration - See *Density*.

Concurrent Flow - Reserved lanes in the same direction as peak flow and on the same side of the median.

Conditional Service - A dual-ring feature which allows re-service to an odd phase (left turn) once the opposing through phase has gapped out. The service is conditioned by the time remaining in the adjacent through phase's MAX time.

Conditioned Line - A communications cable specially compensated to provide improved transmission characteristics.

Conditioning - A common-carrier service whereby the electrical characteristics of a channel are tuned so as to give improved transmission.

Conditions to Contract - General and special conditions set forth in a written statement that forms part of the contract documents and prescribes the manner in which a contract is to be carried out.

Conductor - Same as *Wire*. Used to transmit information (i.e., electrical impulses) between computer and controller as well as within the computer and controller/signal subsystems.

Conduit - A cylindrical structure, usually of steel or polyvinyl chloride, which provides protection from communication cable.

Conflict Monitor - An electrical device that checks the green and yellow indications for each phase to protect against improper conflicting signals. Provides an output in response to conflict.

Conflicting Phases - Two or more traffic phases which cause interfering traffic movements if operated concurrently.

Congestion - A freeway condition where traffic demand exceeds roadway capacity. Normally occurs during peak travel periods or hen a traffic incident reduces capacity by creating a bottleneck. Includes high densities, low volumes, low speeds, stop-and-go driving, and increased delay.

Congestion Detection - A system of hardware and software designed and operated to provide data on the level of traffic congestion in the area being monitored.

Congestion Strategy - A strategy that optimizes corridor operations to minimize the spread of congestion.

Connector - Hardware installed on cable ends to provide physical attachment to a transmitter, receiver, other hardware, or another cable.

Console - A device used for communication between the operator and the computer. A console includes display panels, CRT, some type of hard-copy printer, and a system control panel.

Conspicuity - A measure of a motorist's ability to see or notice a sign

Construction Management - The process that entails the following activities: inspection of day-to-day construction tasks; witnessing of acceptance tests; review and approval of shop drawings; and review completed tasks.

Construction Phase - That part of a project which deals with construction.

Consultant/Contractor Approach - The traditional procurement approach for traffic system contracting. The consultant develops the plans, specifications and estimates (PS&E). A separate contractor bids the job, supplies the hardware and installs the system.

Contention - Communication systems which permit more than one transmitter to send simultaneously. Message interferences are detected and the signal is retransmitted at a later time.

Continuous Flow Intersection - A patented intersection design that can solve operational problems caused by heavy turning movement at conventional intersections.

Continuous Presence Mode - Detector continues if any vehicle (first or last remaining) remains in the field of influence. (This definition should not be understood to imply that the use of this mode guarantees that the output will continue for whatever length of time the vehicle remains in the detection area, as some detectors are not capable of holding a call indefinitely.)

Contract Documents - The design plans, technical specifications, bid proposal, bonds, notice of award, addenda, and modifications to the contract.

Contract Qualifications - Contractors must be qualified to perform on the project. Qualification involves an evaluation and general review of contractor financials, past experience and conformance to state business regulations.

Contraflow Lane - Reserved lanes on the opposite side of the median where high occupancy vehicles (HOVs) move against the flow of traffic.

Control Area - A grouping of sections. (A section is the smallest grouping of intersections that the computer considers. These intersections are so interdependent or close together that they always work in coordination.) Control areas are generally defined by the physical proximity of sections and by the similarity of traffic conditions which permit independent control by the computer within the constraints imposed by required interface between sections and overall system requirements.

Control Center - Consists of the room(s) that contains the computer equipment, displays and controls, and houses the personnel who operate this equipment used in a computerized traffic control system. (See ***Traffic Operations Center***.)

Control Interval - Period of time during which signal timing parameters are held constant.

Control Panel - (1) ***System Control Panel*** — A panel for operation of the system. (2) A panel on the computer designed for use by the computer operator in communication with the computer.

Control Subarea - Subdivision of a single control area. (See ***Section***.)

Control Variables - Traffic condition indicators which are used as the basis for selecting traffic control strategies.

Controllability Index - A measure of the degree to which traffic responsive ramp control can vary the metering rates.

Controller - A device which controls the sequence and duration of indications displayed by traffic signals.

Controller Assembly - A complete electrical mechanism mounted in a cabinet for controlling the operation of a traffic signal.

Controller Hardware — Electromechanical - A 1970's pretimed signal controller standard. Consists of a dial unit (motor, gears, cycle and timing keys), and a camshaft (stepper motor, cams with switch breakouts and switch contacts).

Controller Interface Unit (CIU) - The piece of equipment inserted between the local intersection communication terminal and the intersection controller unit to translate the instructions from the computer into commands that are recognized and responded to by the controller unit.

Controller Unit - The part of the controller assembly which performs the basic timing and logic functions.

Controller Voltage Monitor (CVM) - An open collector output maintained low by the controller as long as the internally generated operating voltages are within tolerances. Used by the conflict monitor to place the intersection in flash should voltages fail.

Conversational Mode - A mode of operation of a data processing system in which a sequence of alternating entries between a user and the system resembles a conversation between two persons.

Coordinated Controls for Incident Management - A strategy that coordinates a set of changeable message sign messages, lane control signals and variable speed limit signs to implement incident management plans.

Coordination - The establishment of a definite timing relationship between adjacent traffic signals.

Coordinator - A device used to relate the timing of one controller unit to others.

Cordon Counts - Number of vehicles crossing a line defining an enclosed area. Both entries and exits from the enclosed area are recorded during selected time periods.

Core residents - The word *resident* as used here denotes a program or routine which is available in the processor memory. Nonresident programs are taken from peripheral storage devices.

Core Storage - See **Processor Storage**.

Corridor - A freeway and the system of roadways influenced by the freeway which accommodates travel demands over a large geographical area.

Corridor Control - The coordinated set of strategies that include ramp metering, diversion control and arterial signal control to optimally distribute the traffic load among all corridor routes.

Corridor Control Strategies - A set of four control strategies that optimize operation of a traffic corridor. Strategies include: Local Coordinated; A real wide Integrated; Diversion; and Congestion.

Corridor Control Strategy - Procedure used to integrate the operation of various control and driver information systems in a corridor in order to optimize the use of corridor capacity.

Council of ITS Standards - The council established by ITS America (Standards and Protocol Committee) to coordinate the standards-setting efforts in USA and international. Includes representatives from ANSI, IEEE, SAE, ASTM, EIA, NAB, NEMA, TIA, ITE, and AASHTO.

Credibility - A quality of CMS that implies that the supplied information is timely, accurate, and reliable.

Critical Approach Lane - The approach lane that exhibits the highest ratio of flow to saturation flow.

Critical Density - The traffic density occurring at maximum volume flow. The highway capacity manual considers 67 passenger cars per lane mile as critical. At this density, flow becomes unstable.

Critical Intersection - A selected, heavily traveled intersection within a coordinated arterial. This intersection would be employed to dynamically control the split at selected signalized intersections within the arterial, based on vehicle detector input.

Critical Intersection Control (CIC) - (1) An algorithm employed to dynamically control the split at signalized locations where the traffic patterns are such that special control, responsive to changing conditions, is needed. (2) Within the UTCS control operation, a specific algorithm that is implemented at saturated intersections. It adjusts splits in accordance with phase demand using the non-random traffic trend data.

Critical Lane Detection - A system of hardware and software designed to provide data on traffic flow for a select lane, usually the heaviest volume lane on an approach to a signalized intersection.

Critical Path Method (CPM) - A project management tool for planning, organizing and controlling projects. Uses a network diagram based on scheduled activities and events with time duration's assigned to activities. Monthly status of planned versus actual activities establishes a snapshot of percent completion.

Crosstalk - Mutual coupling of magnetic fields, producing interaction between two or more detector units in the same cabinet, when the units are operating at similar frequencies. Crosstalk results in a detector outputting an actuation in the absence of a vehicle.

Crosswalk - Any portion of a roadway at an intersection or elsewhere distinctly indicated for pedestrian crossing by lines or other markings on the surface.

CTA Smart Bus - An example of a transportation corridor that includes an Automobile Vehicle Location (AVL) function and bus traffic signal preemption technologies. Located in Chicago metropolitan area.

CVO - The Commercial Vehicle Operations category of ITS. Includes automation of administrative and regulatory aspects, fleet dispatch and management and automatic vehicle identification and weigh-in motion.

Cycle - In a pretimed controller unit, a complete sequence of signal indications. In an actuated controller unit, a complete cycle is dependent on the presence of calls on all phases.

Cycle Length - The time required for one complete sequence of signal phases.

Cycle Locking - When cycle lengths of approximately the same length are selected by the computer for two or more sections of the system, one consistent cycle length is selected and imposed on these sections. The sections are then, in effect, locked together on the same cycle length.

Cycle Redundancy Code - A commonly used error detection code included in the transmitted signal.

Cycle Selection - The process by which cycle lengths are chosen or calculated by the computer to be imposed on the individual sections of the control system.

Cycle Zero Point - See Time Reference Point.

Data Acquisition - The process by which a computer acquires data from controllers, detectors, and other remote sensors and assembles this raw data for use.

Database - The assemblage of data constraints and parameters used by computer algorithms in the execution of the traffic control function. Normally included are timing parameters, adjustment coefficients, algorithm coefficients, limit parameters, etc.

Database Generator - The program used to assemble a database prior to the initiation of system operation.

Database Updating - The process by which the database is modified to current value levels.

Data Block - One or more data records stored on an auxiliary storage device in a contiguous block in order to make more efficient use of the storage capacity of the device.

Data Collection and Analysis - Operations task to collect traffic data either through gathering of field data or through installed traffic sensors. Data analysis provides basis for modifying signal timing and plan scheduling. Measures of effectiveness are calculated from data.

Data Element - A single unit of data, such as a name or a serial number.

Data Packing - The process of fitting together information which requires less than a full computer word into groups so as to effectively use storage in the computer memory.

Data Record - A group of related data elements treated as a unit in input-output operations.

Data Register - A small capacity (usually one word) data storage area in the CPU.

Data Set - (1) A particular component of data used for a specific traffic control purpose. (2) A modem which performs modulation, demodulation, and control functions that are necessary to provide compatibility between communications facilities and a computer or remote terminal equipment. (**Data Set** is a registered trademark of the Bell System.)

Debug - To detect, locate, and correct mistakes in a computer program. A program that is completely debugged is said to be checked out.

Decentralized Control or Decentralized System - A form of traffic signal control in which the ability to make control decisions and issue commands is placed at more than one location.

Decibel Random Noise (DBRN) - A measurement of power in decibels.

Decoder - A mechanism for translating a code into its various components.

Dedicated lines - Communications lines used solely to interconnect two or more locations not normally switched.

Dedicated Road Infrastructure for Vehicle Safety in Europe (DRIVE) - A European program intended to move Europe toward an Integrated Road Transport Environment. It focuses on improving traffic efficiency and safety and reducing the adverse environmental impact of motor vehicles.

Delay - (1) A measure of the time elapsed between the stimulus and the response. (2) The retardation of the flow of information in a channel for a definite period of time.

Delay Distortion - The degradation of a signal transmitted on a communications line that results from differences in the delay experienced by the various frequency components of the signal.

Delayed Output - The ability of a detector to delay its output for a predetermined length of time following the arrival of the vehicle into the zone of detection.

Deliverable Services - Those services associated with the implementation of a control system which relate to system documentation, training, and maintenance.

Demand - The need for service, e.g., the number of vehicles desiring use of a given segment of roadway during a specified unit of time.

Demand Control (Loop Occupancy Control) - A detector/controller design using long detection loops (normally 30 ft (9 m) or longer), with the unit operated in the nonlocking mode. A loop occupancy controller may, but need not necessarily, be designed to rest in all red in the absence of any traffic demand. Loop occupancy control can use magnetometer detectors as well as loop detectors.

Demand Management and Operations - The ITS user service that supports and implements policies and regulations designed to mitigate the environmental and social impacts of traffic congestion.

Demand Operation - A mode of operation in which the service provided at an intersection reflects the presence of demand for that service often without regard for background cycling.

Demand Strategies - The TSM strategies that focus on decreasing the quantity of vehicular travel. Demand actions include: carpools, vanpools, HOV priority treatments, and variable work hours.

Demand-Capacity Control - An entrance-ramp control strategy for selecting metering rates based on a real-time comparison of upstream volume and downstream capacity.

Demodulation - The process of retrieving information from some previously modulated source. The reverse process of modulation.

Demultiplexing - The process of retrieving two or more communications channels from a multiplexed transmission media.

Density - (1) A measure of the number of vehicles per unit length of roadway (i.e., per lane mile (kilometer)). (2) The number of bits that can be recorded per inch of magnetic media.

Density Contour - Plotting of density levels on a roadway using distance along the roadway as the x-axis and time-of-day as the y-axis.

Density Controller Unit - An actuated controller unit that has timing adjustments for the selection of the allowable gap independent of the passage of time.

Design Plans - Drawings indicating the manner in which components of a control system are to be constructed and installed.

Design Plans and Specifications - The principal elements of contract documents are plans (drawings) and specifications. Plans define the physical relationship of the system. Specifications define the minimum acceptable requirements for equipment and materials.

Design/Build Approach - This approach uses a single contractor to perform work associated with deployment of traffic system. The single contractor has full responsibility for system implementation. The public agency's role is to monitor the contractor.

Detection/Verification Techniques - Techniques available for implementing the detection and verification surveillance functions.

Detection Zone - The area of the roadway within which a vehicle will be detected by a vehicle detector.

Detector - A device for indicating the presence or passage of vehicles or pedestrians. This general term is usually supplemented with a modifier, i.e., loop detector, magnetic detector indicating type.

Detector Amplifier - See Amplifier.

Detector Failures - The occurrence of detector malfunctions, including non-operation, chattering, or other intermittently erroneous counting.

Detector Memory - The retention of an actuation for future use by the controller assembly.

Detector Mode - A term used to describe the duration and conditions of the occurrence and conditions of the occurrence of a detector output.

Detector Setback - Longitudinal distance between stopline and detector. **Detection Zone**: That area of the roadway within which a vehicle will be detected by a vehicle detector.

Detector System - The complete sensing and indicating group consisting of the detector unit, transmission lines (lead-ins), and sensors.

Detector Unit - The portion of a detector system other than the sensor and lead-in, consisting of an electronics assembly.

Diagnostic - (1) Pertaining to the detection, discovery, and further isolation of a malfunction or mistake. (2) A program that facilitates computer maintenance by detection and isolation of malfunctions or mistakes.

Diagrammatic Sign - Class of sign which combines graphics or symbols with selective alphanumeric displays.

Dial - Generally referenced to a pretimed type of control. Consists of a dial with graduations in one percent increments 0 to 100. The scale graduations are matched with physical locations of switch actuations on initiate signals used in sequencing signalization.

Dial Control - An alternative method of computerized control of an electromechanical type controller. The computer controls the dial motor by issuing a dwell signal. When the dwell signal disappears, the dial restarts and follows the fixed interval pattern (i.e., vehicle change and clearance intervals, pedestrian clearance intervals, leading/lagging greens, etc.), as contrasted with camshaft control. (Same as **Dial Supervision**.)

Dial Disconnect - The process of interrupting the connection between the dial pulsing circuit and the signal camshaft rotational device in some types of intersection controllers.

Dial Supervision - The technique for allowing the dial to dwell for an adjustable period of time in one or more of the intervals comprising the cycle. This permits the computer to independently extend the duration of each phase beyond it's preset minimum.

Dial Unit - Consists of a dial graduated in one percent increments from 0 to 100 percent. Timing keys placed in the dial unit are used to effect changes in signal indications.

Diamond Interchange Operation - The operation of a standard 8-phase controller unit with modified software for signalization of a full diamond interchange.

Dielectric - An insulator occupying the space between two conductors such as the inner and outer conductors of a coaxial cable.

Digital - Information in discrete or quantized form; not continuous.

Digital Computer - An electronic device capable of accepting information, applying prescribed processes to the information, and supplying the results of these processes. It usually consists of input and output devices; storage; arithmetic and logic units; and a control unit.

Digital Logic - (1) Logic related to numbers through the use of arithmetic and logic processes. (2) Hardware to effect these processes.

Digital Signal Transmission Standards - The standards for transmission based on data rates and formats. Standards are specified for: serial ports; high-speed Data Rate Channels; Optical Interface Channels; CCTV and Video Transmissions, including full motion, coded TV; and freeze frame video.

Digital Traffic Control Computer System - A control system that uses a digital computer to control traffic signal controllers.

Dilemma Zone - A distance or time interval related to the onset of the yellow interval. Originally the term was used to describe that portion of the roadway in advance of the intersection within which a driver can neither stop prior to the stopline nor clear the intersection before conflicting traffic is released. That usage pertained to insufficient length of timing of the yellow and/or red clearance intervals. More recently the term has been used also to describe that portion of the roadway in advance of the intersection within which a driver is indecisive regarding stopping or clearing, although the signal timing is long enough to permit either. That portion of the roadway in advance of the intersection within which a driver is indecisive regarding stopping prior to the stopline or proceeding into or through the intersection. May also be expressed as the increment of time corresponding to the dilemma zone distance.

Dilemma Zone Protection - Any method of attempting to control the end of the green interval so that no vehicle will be in the dilemma zone when the signal turns yellow, or delay the onset of an opposing green indication if a vehicle is in the dilemma zone.

Dimming - This feature allows selected signal indication to be dimmed during night time operation.

Direct Access - Data in storage can be read and written without processing the data which precede it on the storage device. The time required for data access is efficiently independent of the location of the data. Disks and drums are direct access devices. (Also see ***Random Access***.)

Direct Addressing - An immediate and explicit indication of the referenced location. It is usually a part of the computer instruction specifying the location of the operand or the location of another instruction. (In contrast, see ***Indirect Addressing***.)

Direct Memory Access (DMA) - A method used in computerized systems to allow high-speed peripheral equipment to obtain stored data on a cycle-stealing basis. This allows simultaneous processing and input/output data transfer.

Direct Wire - A communications method that uses wire interconnect between the transmission and reception points with no multiplexing. (See ***Dedicated Line***.)

Directional Detector - A detector capable of being actuated only by vehicles traveling in one direction.

Directional Lane Controls - Lane controls are desirable when significant unbalanced flows change direction during or between peak periods. Often used in tunnel or bridge operations in response to incidents or maintenance actions.

Disc (Disk) - (1) The circular-shaped device used in the production of some changeable message sign legends. It may be retro-reflective or solar. (2) A peripheral device used in computer systems to provide large volumes of storage that is available to the computer in blocks with an access time delay on the order of 100 milliseconds or less.

Disk File - A segment or block of disk memory separated for storage of particular information.

Display Map - A graphic display of the street or freeway system being controlled showing the status of the signal indications and possibly the status of traffic flow conditions.

Distortion Noise - Changes the shape of the received waveform from the transmitted waveform.

Distributed System - A control system in which individual computers are installed in each of the major control areas of a total system, and a supervising master is used to provide interface between the individual areas and to make decisions on timing patterns affecting two or more areas.

Diversion - An aspect of corridor control which refers to the directing of traffic from corridor links with excess demand to those with excess capacity.

Diversion Strategy - A strategy that optimizes corridor operations in response to corridor incidents.

Diverted Traffic - Vehicles which choose not to use the freeway, or enter it from another location or at another time instead of waiting to enter at a particular entrance ramp. Also refers to drivers who choose to use another mode of transportation (e.g., carpools or public transit) instead of driving on the freeway.

DMS - **Dynamic Message Sign**

Documentation - A deliverable that reflects the as-built system and fully describes the operation and maintenance procedures for the system hardware and software.

Doppler Effect - A change in the frequency with which waves from a given source reach an observer, when the source and the observer are in rapid motion with respect to each other, by which the frequency increases or decreases according to the speed at which the distance is decreasing or increasing.

DOS (Disk Operating System - An organized collection of techniques and procedures for operating a disk-drive based computer system. This can be part of a software package designed to perform input/output procedures, sort, data conversion, or test, to name a few.

Double Alternate - A progressive timing technique based on fixing the same offset at two adjacent intersections with a half-cycle shift every two intersections.

Downtime - The time during which a device is unavailable for normal operation.

Downtime Accumulator - A clocking mechanism activated during the interval when a device is inoperable. It provides a measure of the cumulative total elapsed downtime. Usually used to determine the length of a power outage.

Downloading - A function of a traffic system whereby the master controller can access the local controllers memory to update or modify a stored timing plan or controller setting.

Downstream - The roadway extending, from a reference point, in the direction of the traffic movement that is being discussed.

Drift - Change in the electrical properties of the detector system or a portion of it due to environmental changes, particularly temperature variations and rain water.

Drive I - The first phase of DRIVE (Dedicated Road Infrastructure for Vehicle Safety in Europe). A three-year pre-competitive research program, sponsored by the European CEC, with joint industry and public funding for planning of ITS projects. It emphasizes infrastructure requirements, traffic operations, and technologies.

Drive II - Called the Advanced Transport Telematics (ATT) program. A three-year European CEC program emphasizing ITS field trials and pilot projects. Includes Demand Management Integrated Urban Traffic Management, Traffic and Travel Information, Integrated Inter-Urban Traffic Management, Driver Assistance and Cooperative Driving, Freight and Fleet Management, and Public Transportation Management projects.

Driver Information System - Concept of traffic control which advises motorists of prevailing traffic conditions and in some cases, provides recommendations as to the best routes to travel. Devices including message signs and roadside radio, provide information to motorists to drive safely and divert to alternative routes.

Drop Procedures - (1) The orderly processes or operations to remove a controller from the control of the computer. (2) The process followed at the local intersection when a communications failure occurs.

Drop/Insert Unit - A dual fiber optics repeater with an electrical port that can interface with the TS2 NEMA and Model 170 type controllers.

Dual Entry - A fully activated operating mode in a dual-ring controller unit in which one phase in each ring must be in service.

Dual-Ring Controller Unit - A controller unit that contains two interlocked rings arrange to time in a preferred sequence and allow concurrent timing of respective phasing in both rings subject to compatibility lines.

Dummy Interval - A redundant interval in the cam switching mechanism incorporated to allow the total number of intervals in the cycle to correspond integrally with the total number of intervals provided on the cam switching mechanism.

Dump Programs - Software used to output specified areas of storage which is useful in debugging computer programs and system diagnosis.

Duplex - Two-way communication on a single communication channel. (See *Half Duplex* and *Full Duplex*.)

Dwell - See Rest.

Dynamic Artery Responsive Traffic Signal (DARTS) System - An open-loop arterial system consisting of a series of NEMA-type, fully-activated traffic signals each with an external logic modular coordination unit. DARTS achieves platoon progression on an intersection-to-intersection basis.

Dynamic Range - The difference between the maximum and minimum acceptable input power levels at communication receivers.

Dynamic Split Adjustment - The process or computer program used to vary the split among the various phases of a cycle in real-time in accordance with the conditions to be satisfied.

Earth Station - The terrestrial equipment component of a satellite-based communication system.

Ease of Operations - The quality of a traffic control system to easily develop, maintain and update system data-bases, including timing plans.

Echo Distortion - The distortion caused by an impedance mismatch or by a sudden change in the properties of a line which results in an echo or reflected wave which lowers the quality of the transmitted signal by distorting the shape of the wave.

Electrically Erasable Programmable Read-Only Memory (EEPROM) - An electrically erasable PROM. The contents of this device are modified through the application of an electrical voltage that is higher than voltages that are applied by the microprocessor during normal operation. Also designated as the ***Electrically Alterable PROM, EARPROM***.

Electromagnetic - Produced by electromagnetism resulting from magnetic material surrounded by a coil of wire through which an electrical current is passed to magnetize the material.

Electromagnetic Reflective Disk Matrix - Signs formed by a grid of disks. Each disk is a pixel of a typical 5 x 7 array of pixels that form a character. Each disk has a side of white and one of dark. The disks are flipped to create characters and create a message.

Electromagnetic Spectrum - The entire available range of sinusoidal electromagnetic wave frequencies.

Electromagnetic Wave - Electric and magnetic waves are time varying electric and magnetic fields in a volume of space which are related by Maxwell's equations. Electromagnetic fields provide the basis for the wire line, wireless, and optical communication technologies described in this handbook.

Electro/Mechanical - Refers to equipment which performs its functions on the basis that an electrical impulse causes a mechanical action to take place. No electron tubes or significant solid-state devices are used.

Electromechanical Controller Unit - A controller unit which performs it's functions on the basis that an electrical impulse causes a mechanical action to take place.

Electronic- Generally applied to equipment using electron tubes and/or solid-state devices. This catalog separates the two with electronic specifically assigned to electron tube equipment only.

Electronic Industries Association RS 232 (EIA 232) - The standard interface between data terminal equipment and data communications equipment employing serial binary data interchange. Restricted to 50 ft (15 m) and relatively slow speed.

Electronic Monitoring (of incidents) - The detection of roadway incidents using specific algorithms operating on mainline detection data. Typical algorithms are the California, APID, and McMaster.

Electronic Payment Services - This ITS user service allows travelers to pay for transportation services electronically.

Emergency Management - The bundle of ITS user services that includes: emergency notification and personal security, and emergency vehicle management.

Emergency Notification and Personal Security - This ITS user service includes two capabilities: driver and personal safety; automatic collision notification. Driver and personal safety provides for user initiated distress signals for mechanical breakdowns or carjackings. Automatic collision notification transmits information regarding location, nature, and crash severity to emergency safety.

Emergency Repairs - All work required to restore a signal installation, or system, to it's original state after a service failure.

Emergency Vehicle Management - The ITS user service tat reduces the time for emergency vehicles to respond to an incident.

Emergency Vehicle Preemption - The transfer of the normal control of signals to a special signal control mode for emergency vehicles.

Emissions Testing and Mitigation - This ITS user service provides information for monitoring air quality and developing air quality improvement strategies.

En Route Driver Information - This ITS user service includes driver advisories and in-vehicle signing. Driver advisories resemble pre-trip planning information, but are provided once travel begins. In-vehicle signing provides in the vehicle the same type of information on physical road signs today.

Encoder - (1) A device which converts data into a form for transmission over the communication link between two points in a system. (2) A circuit to transform data from one form to another, e.g., convert discrete decimal characters into binary characters. (3) A system which converts signals which have been fed into the system individually into combinations of outputs.

Entrance Ramp Control - Regulation of the number of vehicles per unit time entering a freeway so that demand on the freeway does not exceed capacity; and/or the guidance of vehicles entering a freeway into gaps in the freeway traffic stream, in order to improve the safety and capacity of the merging operation.

Envelope Delay - (1) ***Absolute Envelope Delay*** refers to the amount of delay encountered by the modulating energy in a signal between the sending and receiving end of any circuit. (2) ***Relative Envelope Delay*** is a difference in delay at various frequencies but with a specific frequency selected as a reference point for all other frequencies.

Environmental Detectors - Detects adverse weather conditions, so systems can control or advise travelers appropriately.

Equipment Breakdown - Any event that causes a loss of signal indication to any or all phases on traffic approaches. Breakdown's include: controller failure, cable failure, and loss of power.

Equipment Malfunction - Any event that impairs the operation of a control system without losing the display and sequencing of signal indications to all approaching traffic. Malfunctions include detection failures and loss of interconnect.

Equipment Status Monitoring - The ability to determine the operational characteristics of a remote device in terms of *operating normally, malfunction, communications errors, etc.*

Equipment/Material Specifications - This specification type describes in detail the individual capabilities and features of each component or subsystem.

Erasable Programmable Read-Only Memory (EPROM) - A device that stores data which can be altered through the use of a special device.

Error - Any case wherein the data received from a channel does not agree with the data transmitted.

Error Control - The methodology of detecting communication system errors and responding to this information.

Error Correction - The process by which sufficient redundant or check information is included with data that are transmitted so that the receiver can, within certain ranges or error, reconstruct the correct message from a message that is received in error.

Error Detection - Similar to error correction except that check information is used only to identify erroneously received data, and no correction is made. Requires far less redundancy and check Information.

Error Rate - The expected frequency of transmission errors over a channel, usually expressed as the ratio of bits-in-error to total bits transmitted. One error per 100,000 bits transmitted gives an error rate of 10^{-5}.

ERTICO - The European Road Transport Telematics Implementation Coordination Organization that coordinates European RTI/ITS. Coordinates DRIVE II implementation and other projects to ensure a smooth transition from R&D to a commercial market. It's functions resemble those of ITS America.

Evaluation Process - The process for system evaluation includes the following steps: establish objectives that define a desired level of performance improvement; select MOEs for the standard of comparison; and implement the before-and-after evaluation.

Evaluation Sampling - Sampling techniques effect the level of error in an evaluation process. Factors that influence the design of sampling include: importance of detecting a difference; expected size of difference, and cost of data collection activity.

Enhanced Value Iteration Process Actuated Signals (EVIPAS) - An automated computer program for calculation of intersection signal timing plans for activated signals.

Exception Days - A traffic pattern timing routine stored in controller memory which is activated to compensate for unusual traffic flow caused by a special event (such as a sporting event).

Exclusive HOV Ramps - Ramps provide exclusively for the use of HOV vehicles or buses. Applications include bus terminals, park and ride facilities, tunnel and bridge approach ramps.

Exclusive Pedestrian Phase - A traffic phase allocated to pedestrian traffic only, provides a right-of-way pedestrian indication to the exclusion of all vehicular phases (all red).

Executed Cycle - The portion of a CPUs operational cycle during which the decoded instruction is executed.

Executive Routine - A supervisory program used to control the processing of specific programs.

Exit Ramp Closure - Type of exit ramp control which allows no vehicles to leave the freeway at a particular egress or exit point.

Exit Ramp Control - Regulation of traffic flow leaving a freeway at a point of egress or exit.

Exit Ramp Metering - Restriction of traffic flow leaving a freeway at a point of egress or exit.

Expansion Wave - Boundary, moving downstream of an incident, between the region of traffic flow affected by the incident and that region of traffic flow not affected by the incident.

Explicit Signal Coordination - A controller technique that links local controllers with a communication channel. A master controller establishes the coordination or sync pulse for all controllers in a system.

Extended Binary Coded Decimal Interchange Code (EBCDIC) - An 8-bit representation of original 6-bit BCD codes.

Extended Call Detector - A detector with carry out output. It holds or stretches the call of a vehicle for a period of seconds that have been set on an adjustable timer incorporated into the detector. It can be designed to begin the timing of that period when the vehicle enters the detection area, or when it leaves.

Extendible Recall - A form of recall whereby the associated phase will always serve MIN green and further green time is subject to detector extension.

Extension Detector - A detector that is arranged to register actions at the controller only during the green interval for that approach so as to extend the green time of the actuating vehicles.

Extension Green Interval - For a fully-actuated controller, that portion of the green interval in which timing resets with each subsequent vehicle actuation.

Extension Unit - The timing interval during the extensive portion which is resettable by each detector actuation. The green interval of the phase may terminate on expiration of the unit extension time.

Fading - Variation in the field strength or other properties of a received radio wave signal as a result of changes in the electromagnetic field propagation characteristics of the transmission path with time.

Fail-safe (output-relay design) - A type of output-relay design that produces a constant call, thereby keeping traffic moving, in the event that the detector unit loses power.

Feedback - A system or circuit path which is provided to verify or limit the response to a command. Provides an indication that a command has been executed properly.

Fetch - The procedure by which one or more bytes of data are collected, then transferred from processor storage to the CPU.

FHWA - Federal Highway Administration, formerly the Bureau of Public Roads.

Fiber Light Detectors - Optical conversion devices including the P-n junction photodiode (PIN) and Avalanche Photo Diode (APD), that convert the optical energy into modulated electrical signal.

Fiber Light Sources - Optical devices, including Light Emitting Diodes (LED) and Injection Laser Diodes (ILD), that provide the modulated light energy coupled into the fiber. These devices operate in the infrared portion of the EM spectrum.

Fiber Optics - A broadband communication technology based on an optical waveguide that channels the light in the fiber with total internal reflection at the boundary.

Fiber Splices - A splice permanently joins two optical fibers. Two types of splices used are fusion and mechanical. Typical power loss at a splice is 0.35 to 0.70 dB.

Fiber-Optic/Flip Disk Signs - These signs come from the electromagnetic reflective disk matrix type. The disk surface that reflects has an opening to pass fiber-emitted light, the black disk surface blocks the light transmission.

Field Terminals - Devices for connecting wires entering the controller assembly.

Filtering Equation - An equation used to smooth discrete data and determine the average trend of the data. The equation is used in an iterative process to determine smoothed data points.

Firmware - Memory and it's contents that cannot be changed readily.

First-Generation Control (1-GC) - This type of control is based on a table lookup approach. A number of fixed timing plans have been precomputed and stored. Timing plans are selected based on sensing certain demand parameters at strategically located detectors. As thresholds are reached, predevelopers and stored timing plans are implemented. During the 1980's, this procedure was used in most of the operational digital computer control systems.

Fixed Delay - Time loss caused by traffic control devices (e.g., signals, stop signs, railroad crossings) which occur regardless of the amount of traffic volume and interference present.

Fixed Grid Fiber Optic Sign - A fiber-optic sign disperses light energy from a point of light source through fiber bundles that form messages on the sign's face.

Fixed Grid Light Emitting Diode Sign - A blank out sign that uses light emitting diodes in fixed formats to represent characters and messages.

Fixed-Head Disk - A magnetic disk system in which read/write head is permanently positioned over a given track on the disk.

Fixed-Time Controller - See Pre-timed Controller.

Fixed-Tuned Loop - Describes a loop-detector unit whose output frequency must be adjusted manually to effect detection.

Flash Switch - A cabinet switch, when operated, discontinues normal operation and causes the flashing of any predetermined combination of signal lights.

Flip Flop - An electronic device used to temporarily store one bit.

Flow Rate - Number of vehicles passing a point on the roadway during a specified time period.

Flowchart - A graphical representation showing the interconnected sequential logical steps required for the definition, analysis, or solution of a problem. Used to describe a process by displaying it's function in the order and priority of flow.

Foldout Sign - The foldout sign is a relatively simple message sign, using a small motor to swing two panels across the face of a standard metal sign.

Forcast - A timing plan generation product, developed by Computran Systems Corporation, implements 1 1/2 Generation Control.

Force-off Controller Command (*FO*) - Is used by master controller to begin termination of an activated phase.

Forced Flow - The zone of traffic flow at which flows are below capacity and storage areas consisting of queues of vehicles form. Speeds are reduced substantially, and stoppages may occur for short or long periods of time. Normal operation is not achieved until the storage queue is dissipated.

Foreground Processing - A term describing the higher priority tasks to be processed in a multilevel computer processing environment. (See ***Multiprocessing, Background Processing***.)

Fortran (Formula Translation) - A high-level, procedure-oriented, compute programming language. Used for scientific applications characterized by lengthy, intricate computations.

Forward Error Control (FEC) - An error detection technique which includes error correcting codes to catch a limited number of errors.

Free Flow - The zone of traffic at which there is little or no restriction in maneuverability due to the presence of other vehicles. Drivers can maintain their desired speeds with little or no delay.

Freeway - Divided roadway with more than one lane in each direction, with grade separations at cross streets, and with access and egress limited to specially designed locations.

Freeway Entrance Ramp Control - Control at freeway entrance ramps that modulates the flow rate of entering traffic and alternatively shuts the ramp with barriers or gates.

Freeway Operational Tasks - Operations tasks associated with freeway systems include: system monitoring/ intervention; data collection and analysis; system modifications and updates; incident management; and motorist communication through CMS, HAR and the media (i.e., ATIS).

Freeway Surveillance - Process or method of monitoring freeway traffic performance and control system operation.

Freeway-to-Freeway Ramp Metering - A strategy used to improve traffic conditions downstream of major freeway merges.

Freeway Traffic Control Concept - Ideas which express the objectives, principles of operation, control variables, and functional components of a freeway control system.

Freeze Frame Video Transmission - A video image is captured and coded for transmission. After transmission, the coded signal is reconverted and a still image displayed on a monitor.

Frequency - (1) The number of oscillations of a signal per unit of time; referred to in Hertz (Hz) or cycles per second (cps). (2) The number of times an event (i.e., accident, vehicle stop, etc.) occurs per unit of time.

Frequency Band - The range of frequencies occupied by a signal or which can be transmitted by a communication channel.

Frequency Division Multiplexing (FDM) - This technique splits the available transmission frequency range into narrower bands, each constituting a distinct communication channel.

Frequency Modulation (FM) - A method of data transmission whereby the frequency of a sinusoidal waveform (carrier) is changed in accordance with the information that is to be carried. Two frequencies are necessary to represent binary signal values.

Frequency Response - The plot of frequency versus the ratio of output to input signal for a conductor.

Frequency Shift Keying (FSK) - A form of frequency modulation, typically with mark signals represented by one frequency and space signals represented by another frequency. The transmitter is changed from one frequency to another, i.e., keyed to represent a different information character.

Full Actuated - Identifies a type of intersection control with vehicle detector input capability in all phases.

Full Duplex - A communication facility providing simultaneous transmission and reception in both directions.

Full Motion Video Transmission - Video cameras used for traffic control applications conforming to standards defined by National Television Standards Committee (NSTC).

Full-Traffic-Actuated Controller Assembly - A type of traffic-actuated controller assembly in which means are provided for traffic actuation on all approaches to an intersection.

Functional Maintenance - The maintenance task that updates the system database and optimizes signal timing and metering plans. Database updates are required for: detector reallocations; equipment reconfigurations; system expansion; changes to controller types, and preemption routes.

Functional Specifications - This specification type describes what the system, subsystem, or equipment must do in terms of it's performance requirements.

Fundamental Traffic Flow Relationship - The relationship between volume (q), density (k), and space-mean speed (u). Each freeway section has a specific volume-density-speed relationship.

Gamma Correction - A feature on a special circuit in a CCTV camera which expands or increases the ratio between bright and dark objects.

Gap (Passage) - The maximum time on volume density timed controllers allotted for vehicles to proceed through the intersection.

Gap-Acceptance Merge Control - Concept of entrance ramp metering which releases and/or guides ramp vehicles into acceptable gaps in the freeway traffic stream by stopping them at a ramp metering signal and then releasing them, usually one at a time, at a time calculated in accordance with the predicted arrival of an acceptable gap at the nose of the ramp.

Gap-Minimum - The lower limit to which the extendable portion or terminating gap may be decreased on volume density time controllers.

Gap-Out - Termination of a green interval due to an excessive time interval between the actuation's of vehicles arriving on the green, so as to serve a conflicting pulse.

Gap-Reduction - A feature whereby the allowed time spacing between successive vehicles on the phase displaying the green during the extensive portion is reduced.

Gap-Speed Detector - Component of a merge control system which measures gap sizes and vehicle speeds in the right lane of the freeway.

Gardiner-Lake Shore Corridor - A traffic corridor in the Toronto metropolitan area. Consists of over 13.5 km of the F.G. Gardiner Expressway and Lake Shore Boulevard into downtown Toronto. Utilizes SCOOT traffic signal control strategy and coordinated response plans for incident management.

Gas Discharge Tube - A device used to protect electronic field devices from electrical transients on the communication or power fines.

General Conditions - That portion of the contract document which relates to general requirements to execution of a contract, work, supervision of work, public safety, payment, etc.

Generation (First, Second, Third) - Denotes significantly different approaches in control philosophies for computerized traffic signal systems: (1) *First Generation* — Uses prestored timing plans developed off-line based on previously collected traffic data. Timing plans can be selected on the basis of time-of-day, operator selection, or automatic matching of the timing plan best suited for existing traffic pattern conditions. (2) *Second Generation* — Contains an on-line optimization process to develop the timing plans in real-time based upon current traffic conditions. (3) *Third Generation* — Deals with individual intersections on a cycle-by-cycle basis using an areawide optimization criteria.

Genesis - A Guidestar project examining feasibility using a personal communications device (PCD) for ATIS applications.

Global Variable - A variable applying to the total system.

Goal - Broad statement which expresses long-range overall desires, policies, and positions.

Government-Furnished Equipment (GFE) - Equipment relevant to a job which is supplied by the governmental body letting the contract.

Graded Index Fiber - An optical fiber whose core has a nonuniform index of refraction. The core is composed of concentric rings of glass whose refractive indices decrease from the center axis. The purpose is to reduce dispersion and thereby increase fiber bandwidth.

Green Band - The space between a pair of parallel speed lines which delineates a progressive movement on a time-space diagram.

Green Control - A scheme for controlling an intersection controller assembly whereby a control circuit causes the controller unit to dwell in green intervals until released by the master control unit. Minimum green times and all fixed intervals are timed by the local controller; offset, split, and cycle length are controlled by the master controller.

Green Extension System - Hardware assembly of extended call detectors and auxiliary logic. The logic can monitor the signal display, enable or disable the selected extended call detectors, and hold the controller in artery green.

Grid- A group of coordination thoroughfares covering a large area with movements in several directions. The entire area is controlled and synchronizes movements to minimized delay. Master control usually is centralized.

Guard Band - A region of unused frequencies that separates the different frequency regions assigned within a transmission system. The guard bands facilitate the separation of the signals. (See *Frequency Multiplexing*.)

Guide Signs - Signs that inform motorists of directions to common destinations. Roadway identification via route markers and other information.

Half Duplex - A communication facility providing both transmission and reception in both directions, but not simultaneously.   (See *Full Duplex*.)

Half Power Point - The upper and lower frequencies which identify the bandwidth of a communication channel or receiver. The power level of the channel or amplification of the receiver at these frequencies is at 50% of the highest value.

Hard Copy - Data permanently recorded on paper, film, etc. for later reference.

Hard-Wired Conflict Monitor - Electrical wiring or circuit in a local controller assembly which acts to prevent certain combinations of signal indications which could result in direct traffic conflicts.

Hardware - The physical equipment in a computer system. (In contrast, see *Software*.)

Harmonic - Frequencies other than the fundamental basic frequency of a repetitive wave. When the waveform of the fundamental departs from a sine wave, harmonics are introduced at integer multiples of the fundamental frequency.

Hazardous Material Incident Response - The ITS user service that provides immediate description of hazardous materials to emergency personnel.

Headway - Time or distance spacing between front of successive vehicles, usually in one lane of a roadway.

Hertz (Hz) - A measure of frequency or bandwidth. One Hertz (Hz) is defined as one cycle per second (cps).

Hierarchical System - A system having various levels of priority or preference.

High Data Rate Channel Standards - The American National Standards Institute (ANSI) T1 standard defines data rate of 1.526 Mbps. Standard applies to traffic systems with high data multiplexing and digital video.

High Occupancy Vehicle Priority Controls - The application of control techniques for HOVs on freeways provides preferential treatment for buses, van pools and carpools in the form of travel time advantage and reliability over lower occupancy vehicles. Methods of control include: separated facilities; reserved lanes; and priority access control.

High-Level Language - A computer programming language using familiar notation, such as English or mathematics, which is easy for the programmer to understand. A high-level language statement will usually generate several machine language instructions. Languages include FORTRAN, C, C++, ADA.

Highway Advisory Radio (HAR) - Also known as Travelers' Information Stations (TIS). These systems provide travel or roadway information to motorists via their radios set to 530 KHz or 1610 KHz in the AM band. The FCC regulates the use of HAR.

Highway User Cost - Highway user costs are the total of vehicle operating costs, travel time, and accident costs.

Hold - A command that retains the existing right-of-way. A command to the controller unit which causes it to retain the existing green interval.

Hold Controller Command - Is used to guarantee a minimum green time to a phase.

Hold-On-line Signal - A signal to an intersection controller commanding it to remain under computer control.

Houston Smart Computer - An ITS operational test project that is applying a variety of innovative advanced technologies to introduce ITS functions and encourage greater use of high-occupancy commuter modes. Includes I-45 North Bus Lane and I-10 West Carpool Lane.

HOV Priority Systems - Lane priority assigned to high occupancy vehicles. Techniques on surface streets include: exclusive contraflow lanes on one-way streets, and exclusive left-turn movements.

Hybrid CMS - A CMS that incorporates both Light Reflecting and Light Emitting message characters.

Hysteresis - A lagging in the return of values to their previous levels, as if from internal friction. Used to describe the delay in recovery of traffic service rate following a breakdown due to congestion.

Implementation - The process of bringing a traffic control system from concept to operation. Includes feasibility study, design, and installation.

Implementation Plan - Includes development of a system design, finding qualified source(s), procurement strategy, construction management plan, system startup plan, and operations and maintenance plan.

Impulse Noise - Voltage spikes which are impressed on a line or circuit as a result of momentary voltage surges.

IMSA - International Municipal Signal Association.

Inbound - The traffic condition wherein an imbalance exists with a heavier flow towards central points. Also described as the A.M. peak period.

Incident - An occurrence in a traffic stream which causes a reduction in capacity or abnormal increase in demand. Common incidents include accidents, stalled vehicles, spilled loads, etc.

Incident Detection - The arrangement of detectors and processing of detector information to arrive at the decision that some type of incident has probably occurred I the traffic stream. May also be done by visual and third-party reporting means.

Incident Detection Algorithms - Algorithms used to detect incidents based on mainline detector data. Algorithms can be based on pattern recognition, statistics, catastrophe theory, or neural networks.

Incident Management - The coordinated pre-planned use of human and technological resources to restore full capacity after an incident occurs and to provide motorists with information and directions until the incident is cleared. This is an ITS user service.

Incident Response Plan - The plan among agencies that establishes the activation, coordination and management of people, equipment communication and information media designed to mitigate the effects of a roadway incident.

Incident Verification - The surveillance function that determines the location and nature of an incident as well as display, recording, and communications to appropriate agencies.

Indemnification - The act of being secured against hurt, loss, or damage.

Index of refraction - The ratio of the velocity of light in free space to the velocity of light in a given material.

Indexing - The method of retrieving data elements from arrays.

Indirect Addressing - A method of computer cross reference in which one memory location register, or operand indicates the correct address of the intended location. (In contrast, see *Direct Addressing*.)

Inductance - That property of an electric circuit or of two neighboring circuits whereby an electromotive force is generated in one circuit by a change of current in itself on in the other. The ratio of the electromotive force to the rate of change of the current.

Inductance Cable Antenna HAR Systems - A Highway Advisory Radio (HAR) system that uses a roadside cable. The directional induction radio transmission narrowcasts the radio signals to the width of a multilaned highway.

Inductive Loop Detector (ILD) - A pavement installed active device that senses a decrease in loop inductance during vehicle presence. (See **Loop Detector System** and **Unit**.)

Inform - A major traffic corridor in the Long Island, NY area with two major freeway facilities — Long Island Expressway and Grand Central/Northern State Parkway and several parallel and crossing arterials and freeways. Includes a total of 136 miles (219 km) of controlled roadways over 40 miles (64 km) in length.

Information theory - A mathematical treatment of the generation of information and the limitations on its transmission rate over communication channels.

Infrared Detectors - Passive and active above-ground mounted devices use for pedestrian and/or vehicle presence. Some devices provide counts, speed, length, and queue.

Inhibit - An action or signal which prevents a normal change in the operating sequence of a control. Is used to obtain coordination or other special condition upon command from an external source.

Initial Green - See MIN GREEN.

Injection laser diode - An electronic transmitting device used for fiber optic communication.

Input/Output (I/O) - A general term for equipment used to communicate with a computer.

Input - The introduction of data from an external storage medium into a computer's internal storage unit.

Input-Output Study - Determination of the number of vehicles moving into, out of, or being accumulated in a closed system over a given time period.

Insertion loss - The loss of power that results from inserting a component, such as a connector or splice, into a previously continuous path or at its termination.

Institute of Electrical and Electronic Engineers (IEEE) - Organization that supports ITS for vehicle/road communication protocols, safety critical software, definitions, and terminology. Serves on ITS Standards Coordinating Committee (SCC 32).

Instruction - A set of characters used to define a basic computer operation. An instruction has two basic parts (1) **Operand Code** — Specifies the operation to be performed. (2) **Operand** or **Operand Address** — Specifies the data or the address of the data to be operated on.

Instruction Repertoire - The set of instructions which the CPU is capable of performing.

Instruction Set - The complete repertoire of instructions that a CPU is capable of performing.

Instruction to Bidders - A contract document that tells each bidder how to prepare a bid so that a fair comparison can be made.

Integrated Circuit (IC) - An electronic circuit containing many interconnected circuit elements formed on a single body, or chip, of semiconductor material.

Integrated System Management - A management process that uses a team approach to the deign, installation, operation, maintenance, and upgrade of all the traffic control and motorist information systems in a specific geographic region. Requires coordination, cooperation and teamwork among agencies, management, and operating and maintenance personnel.

Integrated Traffic Management System (ITMS) - (1) The system that integrates all hardware and software elements of transportation management within a geographical region. It includes: traffic signal systems; freeway management systems; traveler information systems; and incident management systems. (2) A signal system that consists of a master control assembly at the control center and field controllers. Originally developed by Intersection Development Corporation. Can work with compatible Multisonic, Model 170 or NEMA controllers. (3) A Guidestar project evaluating effectiveness of fully integrated traffic management and control in Twin Cities metropolitan area.

Intelligent Transportation Systems (ITS) - The collection of transportation services and infrastructure that will implement the goals of ISTEA. The seven categories of service are: travel and transportation management; travel demand and management; public transportation operations; electronic payment; emergency management; advanced vehicle control and safety systems; and commercial vehicle operations. ITS uses advanced technologies to provide the range of traffic-based user services.

Interconnect - The communication media usually consisting of electrical cable connecting the system master with local controllers.

Interconnected Signal System - A number of intersections which are connected by wire, radio, or some other means to effect traffic progression.

Interconnection - The topology for connecting data receivers and transmitters into a network.

Interface - A common boundary at which two separate systems or portions of each join or interact. An interface can be mechanical, as in adjoining hardware surfaces, or it can be electrical, as in signal level transformation points. Moreover, it can also refer to human machine interface and interaction between the operator and the computer.

Interference - A disturbance to the signal which changes its waveshape.

Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA-91) - A Congressional act whose purpose is to develop a National Intermodal Transportation System that is economically efficient and environmentally sound, provide the foundation to compete in the global economy and move people and goods in an energy efficient manner. Provides governmental basis for research and implementation of ITS technologies.

Internal Storage - See **Processor Storage**.

International Standards Organization (ISO) - International standards setting organization. ITS standards coordinated through ISO TC204 committee, and subordinate working groups. Working groups include quality/reliability, public transport, man/machine, commercial fleet management, and integration.

Interrupts - A break in the normal flow of a system or routine such that the flow can be resumed from that point at a later time.

Intersection - The common area of roadways that meet or cross.

Intersection Capacity - Capacity at a signalized intersection is controlled by two factors. Conflict resolution that allocates right-of-way to one line of vehicles while the other waits. Flow interruption for assignment of right-of-way that introduces additional delay.

Intersection Collision Avoidance - The ITS user service that helps prevent collisions at intersections.

Intersection Status - (1) The knowledge of whether a controller intersection is on-line or operating in it's standby mode. (2) In some systems, the knowledge of whether the intersection is displaying Major Street Green or not. (3) In other systems, the knowledge of the particular indication being displayed.

Interval - A discrete portion of the signal cycle during which the signal indications remain unchanged.

Interval Advance - Activation of this input will cause immediate termination of the interval in process of timing.

Interval Sequence - The order of appearance of signal indications during successive intervals of a cycle.

Interval Timing - The passage of time which occurs during an interval.

Invitation for Bid (IFB) - In selecting the contractor for system installation, it is required than an invitation for bid be released and that all qualified contractors be permitted to submit proposals. The IFB process then requires that the local agency select the contractor who has submitted the lowest and best bid.

Invitation to Bid - A contract document that contains a brief summary of the project along with bidding and construction procedures.

Isolation Actuated Intersection Control - A fully-actuated controller design that uses small- and large-area detectors to cost-effectively optimize traffic flows at isolated intersections.

Isolated Controller Assembly - A controller assembly for operating traffic signals not under master supervision.

Isolated Intersection Control - A type of control that operates an intersection signal independent of other adjacent intersections and conditions.

Isolated Local Controller - A local controller that is a standalone unit and times right-of-way assignments independently of other controllers.

Isolated Ramp Metering - Pretimed - A strategy based on coordination of time-of-day metering for a select set of entrance ramps. Distributes the metering task over a number of upstream ramps.

ITS - Intelligent Transportation Systems; formally Intelligent Vehicle Highway Systems

ITS America - A non-profit public/private organization chartered as an advisory committee to the U.S. DOT. It's mission is to advance a national transportation program through development and implementation of advanced technology. Founded in 1991.

ITS National Plan - The plan that provides a commonly shared vision of how development and deployment of ITS services in a nationally compatible intermodal system will address highway and public transportation operational problems.

ITS Planning Process - The planning process for developing and deploying the ITS user services within a particular transportation planning region or transportation mode. A major output of the planning process are User service Development Plans describing activities needed to deploy each service.

ITS Strategic Plan - The plan developed by the U.S. DOT and submitted to Congress. It sets forth the goals, milestones, and objectives of the Transportation Department to implement ISTEA.

Jam Density - Density at which congestion on a roadway causes traffic flow to stop.

Japan Digital Road Maps Association (JDRMA) - The association that prepares and maintains the national digitized roadway database for Japan.

Jump Instructions - A computer instruction whose execution causes the address portion of the instruction to overlay the content of the location counter. This causes a departure from the normal sequence of executing instructions. (Also called a **Branch Instruction** or a **Transfer Instruction**.)

Junction Box - A mechanical unit, usually installed in the ground, which provides an enclosure for connection points at cable junctions.

Keyboard - An array of keys which, when depressed, cause the generation of a specific character or symbol in electrical, printed, or other form. Used in conjunction with appropriate gating elements, the keyboard permits the generation of coded symbols for interpretation by, or storage in, the computer. Thus, the keyboard may be part of a manual input device for a computer, a keypunch, a CRT, a paper tape perforator, or part of an electric typewriter.

KHz - Kilohertz, or thousands of hertz. Hertz means cycles per second, a measure of frequency.

Kinetic Energy - Relative to a traffic stream, kinetic energy is the product of volume and speed (or the product of density and the square of the speed). Usually expressed in terms of vehicle-miles per hour (vmh or vm/hr) (vehicle-kilometers per hour).

Lamp Matrix Sign - An array of incandescent lamps for each message line forms the face of a lamp matrix display. Selectively illuminating the lamps in a character module permits the display of characters to form a message.

Land line - A communications medium consisting of twisted wire pairs, fiber optics or coaxial cable.

Lane - A standard width of roadway of significant proportion to permit a single vehicle safe passage.

Lane Closure & Lane Control - (1) A strategy that prohibits entry to one or more freeway mainlines. Lane control provides a mechanism to assist in reversible lane control. (2) A concept of mainline control which prohibits travel on particular lanes of a freeway.

Lane Control Signal Displays - Signal Displays for lane controls include steady downward green arrows (lane permitted for use) and steady red "x" (lane not permitted for use).

Lane Control Signals - A special signal that permits/prohibits use of specific street or highway lanes.

Lane Occupancy - A measurement of vehicle presence within a zone of detection, usually expressed as the percent of time a given point or area is occupied by a vehicle.

Lane Use Control Signs - Special overhead signals having indications to permit or prohibit the use of specific lanes or the impending prohibition of use. Reversible lane control is the most common use of lane control signs. The MUTCD defines the features of these signs.

Language Translator - A computer program used to translate a source language program into a machine language program.

Large Area Detector- (Area Detector) A detector or series of detectors wired together in series or series/parallel covering an area in the approach to an intersection. Detection area varies from 6 x 40 ft. to 6 x 100 ft. or larger. One of the more common configurations is four 6 x 6 ft. loops spaced 9 or 10 ft. apart for a length of 51 or 54 ft.

Large Scale Integration (LSI) - In integration circuitry, a silicon chip with more than 1,000 logic elements.

Large-Area Detectors - Devices that register vehicle presence in a detection zone as long as a vehicle is present.

Last Car Passage - A selected feature of a volume-density controller unit which, upon gap-out or max-out, will cause the timing of a full extension unit rather than the reduced gap time before terminating the green interval. The last vehicle to have been detected, known as the *Last Car*, will therefore retain the green until it reaches the stopline. Thus, it is assured of avoiding the dilemma zone problem and of clearing the intersection.

Latent Demand - Total number of potential users desiring to use a facility (street or freeway) at a given point.

Lateral Collision Avoidance - The ITS user service that helps prevent collisions when vehicles leave their lane of travel.

Lateral Detector Placement - Detector positioning across the traffic lanes to obtain highest lane approach volume.

Lead/Lag Operation - A feature which makes it possible to reverse the phase sequence on a phase pair basis. The phase pairs, 1-2, 3-4, 5-6, 7-8 when reversed, the odd phase will lag the even phase instead of leading as is normal.

Lead-In Cable - The electrical cable which serves to connect the lead-in wire to the input of the loop detector unit. (Sometimes called a *Home-Run Cable* or *Transmission Line*.)

Lead-In Wire - That portion of the loop wire between the physical edge of the loop to the splice box; for a magnetic detector and magnetometer it is the wire which runs from the sensor (probe) to the splice box.

Leased channels (also leased lines) - Communication channels which are leased from a communications service carrier or supplier such as the telephone company. The lessee has the full time use of these channels during the lease period. Maintenance of the channels is performed by the communications service carrier.

LED/Flip Disk Sign - The hybrid LED/Flip disk sign stems from electromagnet reflective disk matrix technology. In this case an LED provides the light for the opening in the reflective sign face. The black face blocks all light.

Left-Turn Phasing - The phasing options for controlling left-turning traffic. Includes: traffic actuated left-turn phase; protected/permissive left-turn phase; and left-turn phase sequence with timing plan.

Legibility - A measure of a motorist's ability to read the sign's legend.

Level of Service - Defines operating conditions that may occur on a given lane or roadway when it is accommodating various traffic volumes. It is a qualitative measure of the effect of a number of factors including speed, travel time, traffic interruptions, freedom to maneuver, safety, driving comfort and convenience, and operating costs. In practice, selected specific levels are defined in terms of particular limiting values of certain of these factors.

Liaison Council for ITS/RTI Japan - Liaison information exchange inside and outside Japan.

Light Emitting Diode (LED) - A solid state device with illumination properties similar to that of a low power incandescent lamp.

Light Emitting Diode Matrix Signs - LED signs can be constructed in a clustered or discrete format. The clustered format consists of LEDs encapsulated closely together to form a removable pixel fixture. The discrete format mounts individual LEDs to a sign face, groups of them mounted to form pixels.

Light Emitting Non-Matrix - This sign, also called a blank-out sign, offers a fixed selection of messages. Messages are selected by activating the correct light source.

Light Emitting Signs - The messages are formed by lighted pixels or characters against a dark or black background. When all light sources are out, no message is visible.

Limit, Extension - See MAX I.LIMIT, MAXIMUM - The maximum green time after an opposing actuation, which may start in the initial portion.

Limited-Presence Mode - peration of a detector whereby output continues for a limited period of time if vehicles remain in field of influence.

Line Adapter - Another term for a **Modem**.

Linear Drop - Nodes connected in a string or chain with transmission data being "dropped" at a designated node.

Line Printer - A printer in which an entire lien of characters is printed at once. Line printers are used to print large volumes of information as well as specific formatted reports and other data developed during the operation of the computer control system.

Link - (1) **Computer** — A process to gather or write two or more separately written, assembled, or compiled programs or routines into single operational entities. Some computer systems have special programs called linkage editors to connect address components into symbols or to perform relocation to avoid overlapping. (2) **Traffic** — The length of roadway between two signalized locations. (3) **Communications** — Another term for **Channel**.

Link control signals - Modem control signals which control or identify modem states to establish the need for communication, its direction, and the readiness state of the modem.

Link Exchange Carrier (LEC) - The seven Regional Bell Operating Companies and independent telephone companies which provide "local" telephone service.

Listing - (1) **Higher Order Language** — A listing of the source program(s) which reflect the computational processes. (2) **Assembly Language** — An optional binary-output program of the compiler. The listing contains the symbolic instructions equivalent to the binary-code output of the assembler. This assembly-output listing is useful as a debugging aid.

Loader - A user-assistance software program which loads the object program into memory for execution. The loader also links subroutines and manages overlay modules.

Load Switch - A device used to switch power to the signal lamps.

Local Controller Assembly - A controller assembly supervising the operation of traffic signals at a single intersection. (Also see **Controller Assembly** and **Controller Unit**.)

Local Controller: Pretimed - A device that controls all timing intervals to a fixed pre-determined plan. Works best where traffic is predictable and constant.

Local Controller: Full Actuated - A device that controls the length of all timing intervals based on detected traffic demand on the associated approach. Adjusts cycle and split to fit changing demands.

Local Controller: Semi-Automatic - A device that controls some approaches on the basis of detected traffic demand. Non-actuated phases receive minimum green interval that extends until interrupted by actuation on other phases.

Local Controller: Volume-Density - A device that is programmed to control the intervals on selected approaches and phases based on evaluation of approach traffic conditions. Can have added intervals and a reducible gap feature.

Local Coordinated Strategy - A strategy that selects and adjusts ramp metering rates based on local conditions such as traffic signal timings at each interchange.

Local Exchange Carriers - The local provider of the standard twisted pair communication channels and other standard communications channels. Can be the local telephone or cable company.

Local Offset Unit (Local coordination unit; Local Supervisory Mechanism) - An auxiliary synchronous device applied to a non-synchronous controller to cause the controller to keep in step with a control frequency, which may be the AC power frequency. May have multiple-offset capabilities.

Local Signal Preemption - The emergency or transit vehicle transmits a signal to the intersection controller where a special control phase assigns right-of-way.

Local Traffic Intersection Controller - An electromechanical or electronic device that controls the signals at a single intersection, closely spaced multiple intersections, and mid-block crosswalk.

Locking, Section or Group - A method of system control whereby one section (or sub-system) selects the coordination pattern for one or more other sections.

Locking Detection Memory - A selectable feature of the circuit design for a controller phase whereby the call of a vehicle arriving on the red (or yellow) is remembered or held by the controller after the vehicle leaves the detection area until it has been satisfied by the display of a green interval to that phase.

Logic Element - The smallest building block is a computer than can be represented by a logical operation in an appropriate system of symbolic logic.

Longitudinal Collision Avoidance - Detector positioning on a roadway link between two intersections. Placement is influenced by link lane-changing behavioral and source/sink locations.

Longitudinal Redundancy Check - An error code with an additional word provided after an entire message or portion of a message (block). A bit in the new word is computed from the corresponding bit in each data word in a way similar to the parity check.

Loop - A sequence of computer instructions that is executed repeatedly until a terminal condition prevails.

Loop Detector - See ***Inductive Loop Detector***.

Loop Detector System - A vehicle detector system that senses a decrease in inductance of it's sensor loop(s) during the passage or presence of a vehicle in the zone of detection of the sensor loop(s). Means the same as loop detector but is clearer in its inclusion of the wire as well as the electronics package.

Loop Detector Unit - An electronic device which is capable of energizing the sensor loop(s), of monitoring the sensor loop(s) inductance and responding to a predetermined decrease in inductance with an output which indicates the passage or presence of vehicles in the zone of detection. It is the electronics package, exclusive of the loop(s) and lead-in wire.

Loop Occupancy Control - A detector/controller unit design using long detection loop(s) (normally 30 ft (9 m) or longer), and a controller unit operated in the non-locking mode. A loop occupancy controller unit may, but need not necessarily, be designed to rest in all red in the absence of any traffic demand.

Loop System - A combination of loops of wire connected through transmission lines (lead-ins) to the detector input terminals.

Low-Level Language - A computer programming language that is closely related to machine language. A low-level language statement will usually generate a single machine language instruction.

Low-Power Radio - Non-commercial radio used for driver communication.

Machine Independent - A term to indicate that a source program written for a particular computer can also be translated for and executed on other computers (i.e., follows open system standards).

Machine Language - (1) A set of symbols, characters, or signs and rules for combining them, that conveys instructions or information to a computer. (2) A language than can be directly interpreted by the control section of the machine. (3) Information or data expressed in code that can be read directly, used, or written by the computer or peripheral machines without further processing. (See **Assembly Language** and **Compiler Language**.)

Magnetic Detector - A pavement installed device of coiled wire with a highly permeable core. Vehicle induced flux changes causes an induced voltage pulse. Not to be confused with a magnetometer detector.

Magnetic Gradient Vehicle Detector (MGVD) - A device which uses a magnetic principle to detect vehicles.

Magnetic Tape Unit - A computer peripheral device which is used to transmit data to and from a magnetic tape. (Same as **Tape Drive**.)

Magnetometer Detector - A pavement installed device that detects change in the vertical component of the earth's magnetic field caused by presence of vehicle. Not to be confused with a magnetic detector.

Mainline - The freeway proper as distinguished from the entrance ramps, exit ramps, and interchange geometry of the freeway.

Mainline Control - A strategy for the regulation, warning and diversion of mainline freeway traffic. Techniques used include: changeable message signs; variable-speed limit signs; reversible lane control; and controls for incident management.

Mainline Metering - A strategy that restricts traffic flow on a freeway. It is used to mitigate specific freeway conditions. Situations include: to deter traffic from freeways in bottleneck areas; equitable distribution of delay penalties; and minimize emissions in environmental area.

MainStreet Green (MSG) - An electrical signal transmitted from the local controller to the central computer during the period when the local controller is displaying green for the coordinated phase.

Maintenance Assistance - A contractor support service that must be clearly specified by the bid package when required after system acceptance.

Maintenance Level - An indicator of system condition expressed in terms of hours of maintenance per year.

Maintenance Rate of Increase - An indicator or system condition expressed as maintenance time per intersection average over some time period, usually a year.

Maintenance Skill Requirements - Personnel skills for maintenance include: traffic equipment; computer and communication equipment; technicians; and software maintenance programmers.

Major Street Green (MSG) - Data sent from the intersection controller to the computer indicating that the controller is displaying a green signal to the main traffic phase. Commonly referred to as **A-Phase Green**.

Malfunction - Any event that impairs the operation of a control system without losing the display and sequencing of signal indications to all approaching traffic.

Man-Machine Interface - A device, usually a combination of a CRT, keyboard, or control panel, which allows the system operator to communicate with the computer system. In some cases, a specialized language is termed a **Man-Machine Interface** because of it's ability to simplify the conversion between the system and it's operator.

Manifest Demand - The number of users observed to use (or actually using) a facility (street or freeway) at a given point.

Manual Intervention - The ability of the system operator to manually select certain system operations when warranted.

Manual of Uniform Traffic Control Devices (MUTCD) - The manual that is the principal source of standards for static signs. Provides guidance in the areas of: use, application; placement; and operation and maintenance.

Manual Operation - The operation of a controller by means of a hand operated device; i.e., police push button.

Manual Pattern Selection (MAN) - Signal timing plans selected manually by the operation of a computerized traffic control system. Manual selection is higher priority than all other modes of plan selection.

Manual Push Button - An auxiliary device for hand operation of a controller.

Manual Reset - A reset by which it is possible to manually establish the offset. Refer to Offset Seeking Modes.

Map Display - A device which graphically portrays the geometric representation of the system of streets under control. Indicators represent signalized intersections or freeway locations which may display various information provided by the computer system.

Mass Storage - A memory device capable of retaining large amounts of data. (See **Disk, Magnetic Tape Unit**)

Master Controller Assembly - A controller assembly for supervising multiple secondary controller assemblies and/or multiple submaster controller assemblies.

Master Controller Commands - Time-based commands occur during each background cycle to guarantee a green interval for each non-actuated phase and to select time slots for each remaining actuated phase. Commands include force-off, hold, and yield.

Master-Secondary Controller Assembly - A controller assembly operating traffic signals and providing supervision of other secondary controller assemblies.

Maxband - Arterial timing program that optimizes band-width based on a mixed integer linear programming technique.

Maximum 1 (MAX I) - Usually refers to a time limit applied to traffic actuated controls to terminate the right-of-way and prevent massive delays to opposing vehicles during heavy traffic. Termination by maximum usually results in a recall placement to prevent trapping of vehicles.

Maximum 2 (MAX II) - An optional feature usually associated with coordination methods. Provides two possible maximum time settings for cycle or right-of-way interval total time before termination begins.

Maximum Extension - For a fully-actuated controller, the length of time that a phase may be held in green in the presence of an opposing serviceable call.

Maximum Green - In actuated controllers, the longest time for which a green indication will be displayed in the presence of a call on an opposing phase.

Maximum Limit - The maximum green time after an opposing actuation, which may start in the initial portion.

Maximum Variable Initial - An actuated controller setting, associated with Variable Initial, its longest possible extension given to MIN green operating in Variable Initial. See Seconds Per Actuation (S/A).

Max Recall - A feature whereby the associated phase(s) will always serve the MAX time, regardless of detector inputs.

Mean Time Between Failures (MTBF) - The average length of time for which the system, or a component of the system, works without fault.

Mean Time to Repair (MTTR) - When the system or a component of the system develops a fault, this is the average time it takes to correct the fault.

Mean Velocity Gradient - Computer acceleration noise divided by the mean speed.

Measure of Effectiveness (MOE) - The quantitative variables derived from traffic measurements that measure the improvement in traffic operations from a single intersection to a complete system. Common MOEs are: total travel time; total travel; number and percent of stops; delay; average speed; accident rate; and throughput.

Medium Scale Integration (MSI) - In integration circuitry, a silicon chip with between 100 and 1,000 logic elements. (Also see **Integrated Circuit** and **Logic Element**.)

Memory - (1) **Detector Memory** — The retention of an actuation for future use by the controller unit assembly. The phrase might better be detection memory to make it clearer that the memory is within the controller, not the detector. (2) **Nonlocking Memory** — A mode of actuated-controller unit operation which does not require memory. In this mode of operation the call of a vehicle arriving on the red (or yellow) is forgotten or dropped by the controller as soon as the vehicle leaves the detection area. (3) Also used to indicate computer memory.

Memory Chip - An integrated circuit used for computer memory.

Memory Cycle Time - The interval between the call for, and the delivery of, information from a computer central memory. (See **Access Time**.)

Memory Off - A selectable feature of an actuated controller, synonymous with nonlocking detection memory.

Memory Protect - Computer hardware which will prevent the accidental or deliberate destruction of certain parts of memory.

Merge Control - Concept of entrance ramp metering which guides ramp vehicles into acceptable gaps in the freeway traffic stream.

Merge Detector - A detector used to sense the presence of vehicles in the primary merging area of the ramp and freeway mainline.

Messenger cable - A structural cable used to support communication cable installed on poles or bridges.

Metered Ramp By-Pass - Bypass lanes provided at ramp metering locations so that buses, van pools, and carpools avoid ramp queue delay.

Metering - Traffic control method or technique for regulating traffic flow.

Metering Rate - Number of vehicles allowed to enter a given section of a roadway per unit time.

Microcomputer - A programmable computer whose CPU is a microprocessor.

Microprocessing Unit (MPU) - The processor chip used in any microprocessor.

Microprocessing Optimization Vehicle Activation (MOVA) - An advanced control strategy, developed in the United Kingdom. It provides self-optimized control of signal timing at isolated intersections with eight or fewer phases.

Microprogramming - (1) The technique of using a certain special set of computer instructions that consist only of basic elemental operations which the programmer can combine into higher-level instructions as he/she chooses, and can then program using only higher level instruction. (2) Machine language coding in which the coder builds his/her own machine instructions from the primitive basic instructions built into the hardware.

Microsecond - One millionth of a second.

Microwave - Electromagnetic energy occupying the frequency band ranging from approximately 225 MHz to 100 GHz.

Microwave Detector - With microwave detectors microwave energy is beamed toward an area of roadway from an antenna mounted overhead or in a sidefire position on a pole. The antenna is angled toward traffic to create a dopplar effect on the reflected signal. When a vehicle passes through the beam, the energy is reflected back to the sensing unit (antenna) at a different frequency. The detector, electronic unit, senses the change in frequency which is an indication of the passage of a vehicle. The operating frequency is usually either K-band (24gHz) or X-band (10gHz).

Millisecond - One thousandth of a second.

Minimum Acceptable Gap - Smallest time headway between successive vehicles in a traffic stream into which another vehicle is willing, and able, to merge.

Minimum Green Interval - The shortest green time of a phase. If a time setting control is designated as *minimum green*, the green time shall not be less than that setting. For a fully-actuated controller, the first timed portion of the green interval. It is set considering the number of waiting vehicles between the approach detector and stopline.

Min Recall - A feature whereby the associated phases(s) will always serve the MIN green time, regardless of detector inputs.

Minnesota Guidestar - The ITS program for the state of Minnesota. It seeks to develop a statewide intelligent transportation system. Major Guidestar projects are: Genesis, an application of a personal communications device for ATIS applications; Travelink, evaluates effectiveness of enhanced transit information on influencing commuter mode choice and increasing HOV travel; ITMS, evaluates effectiveness of fully integrated traffic management and control in Twin Cities metropolitan area; Rural ITS, evaluates effectiveness of ITS applications in a rural environment.

Mist - Management Information System for Traffic.

Mobile5C - An EPA developed computer program that calculates emission factors for eight vehicle types based on calendar year, ambient temperature, average speed and engine operating temperature.

Model 170 Controller - One of two types of most commonly installed and available intersection controllers. Specifications jointly developed by California and New York. Specifications include sections on electronic modules, connectors, wiring, harnesses, and cabinet enclosures.

Model 2070 Advanced Transportation Controller - The next generation of traffic signal controller under development by California DOT. A microprocessor based controller using OS-9 real-time operating system, with VERSA Module Eurocard (VME) backplane and Motorola 680X0 processor family.

Modem - A modulator/demodulator device that prepares data for transmission and accepts data at reception. Provides interface between computer and field equipment, such as the model 170 and NEMA controllers.

Modification Maintenance - Task that becomes necessary to fix a manufacturing design flaw or change needed to improve equipment characteristics.

Modulation - The process whereby information is superimposed on another signal for the purpose of transmitting the information over a communications link. The desired information is retrieved by a demodulation process.

Module - (1) *Software* — A program unit that is discrete and identifiable with respect to compiling, combining with other units, and loading, e.g., the input to, or output from, an assembler, compiler, linkage editor, or executive routine. (2) *Hardware* — An assembly of electronic or other equipment mounted in a single enclosure.

Monitor - A device that verifies the operations of a data processing system and indicates any significant departure from the norm.

Most - A five-volume book set that explains signal timing and analysis techniques. Includes discussion of all major programs.

Motorist Aid Systems - A motorist aid system assists the detection of stranded motorists, offers means to communicate their needs, and provides appropriate aid response. Types of systems are call boxes, cellular telephones, citizen band radios, and CCTV systems.

Motorist Aid Telephone System - A telephone system with a handset that allows the person reporting to relay unique information.

Motorist Call Boxes - A call box consists of a switch or toggle that signals the operating agency via phone line than an accident has occurred. The box may have message buttons to indicate the type of assistance required.

MOVA Detection - Detector configuration that requires two sets of loops for each approach on an isolated intersection that implements MOVA strategy.

Movement - The term used to identify the direction of travel and the approach of a vehicle at an intersection. See Phase.

Moving Head Disk - A mass storage device using a sensing head which moves over the storage medium.

Multi-Jurisdictional Traffic Management - The management of traffic and transportation systems across multiple agency jurisdictions with memorandums of understanding to effect cooperation.

Multiband - Arterial timing program that tailors progression and bandwidth to traffic flow patterns on a link to link basis.

Multidrop Connection - The connection of more than two data receiver/transmitter stations to a single communications link. Special control signals must then be used to allow communication between the proper units. A multidrop connection is a topology that connects two or more receivers on the same channel (link). (See also ***Point-To-Point Connection***.)

Multilevel Control - Form of traffic signal control which uses a hierarchical arrangement of control units.

Multimode fiber - A type of optical fiber that supports more than one propagating mode.

Multipath Fading - Attenuation of an RF signal due to interference between a direct wave and a reflected wave. Multipath can introduce attenuation in excess of 30 dB.

Multipath transmission - Rapid transmission along a path other than the direct path between transmitter and receiver, often used by reflection and by various atmospheric effects. It may result in fading or interference.

Multiple access contention - See "contention."

Multiple Processor Configuration - Multicomputer system consisting of two or more central processing units. Each CPU can perform a particular set of functions or can control part of the traffic signal system.

Multiplexed DC - A multiplex method which uses a combination of DC voltage amplitudes to transmit or receive messages.

Multiplexer (MUX) - A device which uses several communication channels at the same time, transmits and receives messages and controls the communications lines. This device may or may not be a stored program computer.

Multiplexing - The combining of several signals into one channel.

Multipoint Channels - Communications links (cable runs) which are wired in parallel and multiple sending/receiving stations. Every message to or from any incorporated sending/receiving station is transmitted over the same cable pair.

Multiprocessing - Ability of computer operating system to process more than one programmed task at the same time.

Multiprocessor - (1) A control configuration in which more than one CPU is used. (2) A computer with multiple arithmetic and logic units which can be programmed to run more than one task simultaneously.

Multiprogramming - A situation wherein two or more programs are simultaneously competing for the resources of the CPU.

MUTCD Flash - See Remote Flash.

Nanosecond - One billionth of a second.

National Ambient Air Quality Standards - The air pollution standard for the United States from all pollution sources. Vehicle-related emissions are controlled as a part of this standard.

National Transportation Communications for ITS Protocol (NTCIP) - A proposed open standard protocol for communication between traffic controllers. Adoption of this standard by NEMA and manufacturers will open traffic network to equipment interchangeability.

National Cooperative Highway Research Program (NCHRP) - An agency administered by the Transportation Research Board for conducting research in the various highway construction, design, and operation disciplines.

NEMA - National Electrical Manufacturers Association.

NEMA TS2-1992 Controller - One of two types of most commonly installed and available intersection controller. Adopted by electrical equipment manufacturers. Standard providers operational and electrical requirements for a pretimed and two full-actuated controllers. Type 1 actuated controller standard uses communication ports in place of MS connection. Type 2 actuated controller upgrades the 1983 NEMA TS1 standard.

Neon Sign - This sign uses neon tubing to form legend characters. The sign display area limits the number of allowable messages.

NETFLO Level I - This program is an event based urban network simulator of traffic operations. It is a macroscopic model that does not employ car-following logic. Vehicles move when events occur.

NETFLO Level II - This program was adopted from the TRANSYT flow model. Link specific statistical flow histograms are used to describe the platoon structure of the traffic flow on each network link.

Network Signal Control - Control techniques that are applicable to a signalized roadway grid network. Grid network imposes control constraints including common cycle lengths and closed loop sum of offsets that must be an integral number of cycle lengths.

Network System Control - A type of control applied to a central business district grid. Prevalent local control is pretimed an/or coordinated across all signals in network.

Node - Each signalized intersection in a traffic signal system. Also, each one-way traffic stream between nodes is a link. See Link.

Noise - Random variations of one or more characters of any entity such as voltage, current, and data. Generally, any disturbance tending to interfere with the normal operation of a device or system.

Non-Actuated - Refers to a control type generally in the pretimed category, but can be one phase in any control which does not employ a vehicle call. Right-of-way timing for the not-actuated phase is fixed regardless of traffic volume except for possible dwell.

Non-Locking Detection Memory - Controller feature that sets phases through loop-occupancy control using large-area presence detectors. Waiting calls are dropped when vehicles leave detection zone.

Non-Restrictive Ramp Metering - A form of ramp metering that standardizes vehicle release rates in order to smooth ramp platoons and improve merge safety.

Non-congested - Absence of congestion, which is sometimes arbitrarily defined as a function of traffic variables such a volume, speed, and density.

Non-Directional Detector - A detector capable of being actuated by vehicles traveling in either direction.

Non-proprietary protocol - A communication protocol available to all prospective users and for which technical information is available.

Non-recurrent Congestion - Type of congestion resulting from the occurrence of random or unpredictable events.

Notice of Award - The written notice to the contractor by the owner that the contractor is the successful bidder and that, upon compliance with certain contract requirements (e.g., furnishing bonds, etc.), the owner will execute and deliver an agreement to the contractor.

Number of Stops - Measure of effectiveness (MOE) of control systems which is an estimate of the number of vehicles stopped by traffic signals.

O&M - Operation and Maintenance

Object Program - The machine language equivalent of a source program. The output of a language translator. A program that is ready to be loaded.

Occupancy - Percent of time that a point on the roadway is occupied by a vehicle.

Occupancy Control - Traffic-responsive control strategy whereby metering rates are selected on the basis of real-time occupancy measurements taken upstream or downstream of the entrance ramp.

Off-line - Descriptive of a system, peripheral equipment, or a process not under the control of the central processing unit. (See ***On-line***.)

Offset - The time relationship expressed in seconds or percent of cycle length, determined by the difference between a defined interval portion of the coordinated phase green and a system reference point.

Offset Interrupter - A method of offset seeking which distributes over two or more cycle lengths, any time required for large offset changes.

Offset Seeking - A process performed by the local controller to get in step (in sync) with the master controller. When in sync, the local cycle zero point is offset from the master's sync pulse by a programmable value determined by the active offset period.

Offset Selection - Choosing one of several possible offsets manually or automatically either by time-of-day or in response to some directional characteristic of traffic flow.

Omit, Phase - A command that causes omission of a phase.

On-line - Descriptive of a system, peripheral equipment, or a process under control of the central processing unit. (See **Off-line**.)

On-line Arterial Control System - Control techniques designed for arterial highways and service roads. Includes: DARTS; ACS; Actuated Controllers with Background Cycle; and Field Master Based Systems Signal.

On-line Optimization - A method by which a process, i.e., traffic signal plan, is continually recomputed in real-time to seek the best obtainable set of operating conditions.

On-Line Signal Control Techniques - The algorithms embedded in the signal control system that control the signal arterial or network in real-time. Includes time-of-day and traffic-response techniques.

Onboard Safety Monitoring - The user service that monitors and records the safety status of a commercial vehicle and driver.

OPAC - The Optimized Policies for Adaptive Control; an adaptive traffic control technique.

OPAC Detection - Detector configuration used for isolated intersection control based on an OPAC strategy. Uses upstream detectors to project vehicle arrivals at downstream intersection.

Open Specifications - Specifications written so as to allow several manufacturers to bid on materials and equipment.

Open-Loop Signal System - A system that supervises the intersection controller functions but does not receive feedback station information.

Open-Loop System - Pertaining to a control system in which there is no self-correcting action or feedback as there is in a closed-loop system.

Operating System - Computer software that performs the function of organizing and controlling the overall execution of the application software.

Operation Code (Opcode) - The portion of a computer instruction which designates the operation to be performed such as: Add; Subtract; input; Output; and Logical Operations.

Operational Delay - Time lost as a result of interference between components of traffic. included are delays caused by traffic movements that interfere with stream flow, such as: parking and unparking vehicles pedestrians; stalled vehicles; double parking; cross traffic; and merging/weaving maneuvers.

Optical Communications interface Standard - The ANSI T1 standard (post-1988) is called synchronous optical network (SONET). Defined in terms of optical carrier type N (OC-n) with DS 3 equivalents. OC-3 specifies a bit rate of 155.52 Mbps.

Optical Dispersion - The spreading of the light pulses determine the information carrying capacity or bandwidth of the fiber. Dispersion limits the data transmission speed.

Optical Video Transmission - Video signals may be transmitted using fiber optics: (1) **Baseband**—Unmodulated video signals (2) **Modulation** — Extends the transmission range using AM or FM. (3) **Multiplexed** — Enables transmission of a number of video signals on the same fiber.

Optimization Programs - Programs that compute and evaluate the effects of various sets of signal timing on vehicle flow within a given network. These programs determine optimal timing plans and/or evaluate a given timing plan.

Optimized Policies for Adaptive Control (OPAC) - An advanced control strategy, developed at the University of Massachusetts. It provides self-optimized control at isolated intersections, mutual coordination of adjacent traffic signals, and can serve as part of an interconnected system.

Optimum Density - Traffic-flow density (or concentration) which corresponds to maximum volume of traffic flow on a particular roadway.

Optimum Speed - Traffic-flow speed (vehicle movement) which corresponds to maximum volume of traffic flow on a particular roadway.

Origin-Destination Survey - Survey to determine the point of origin and the point of destination for a given vehicular trip.

Outbound - The traffic condition wherein an imbalance exists with a heavier flow away from central points. Also described as the P.M. peak period.

Out-of-Step - A term used to describe a condition when one or more of the controller assemblies are not in coordination with the control system.

Output - Data transferred from a computer's internal storage unit to an external storage device or output device.

Overheight Vehicle Control Systems - A control system that provides warning of overheight vehicles approaching transportation structures (i.e., bridges, tunnels). System consists of overheight vehicle detectors and warning message devices.

Overlap - A right-of-way indication that allows traffic movement when the right-of-way is being assigned to two or more traffic phases.

Overlay - In a computer, the technique of repeatedly using the same blocks of internal storage during different stages of a program; e.g., when one routine is no longer needed in internal storage another routine can use the same storage area.

Packet radio - A radio data transmission technique based on sending data in defined groups or "packets." This technique is often used to provide all transmitters on the channel the opportunity to access the channel when they have data to transmit.

Parallel Transmission - All bits of the data byte or word are transmitted simultaneously. Used for short distance and fast data transfer. Requires a separate link for carrying each bit.

Parameter - (1) A quantity in mathematics that may be assigned any arbitrary value and that remains constant during some calculation. (2) A definable characteristic of an item, device, or system.

Parity - An error code that adds an additional bit to each data ord. The sum of the 1s in the word and the extra bit must be odd or even as specified. At the receiver, the bits in each received character are checked to see that an odd (even) number of one bits per character is received in order to detect errors in the received data.

Parity Check - A summation check in which the binary digits in a character or word are added, and then sum checked against a single, previously computed parity digit; i.e., a check of whether the number of ones in a word is odd or even.

Passage Detection - The ability of a vehicle detector to detect the passage of a vehicle moving through the detection zone and to ignore the presence of a vehicle stopped within the detection zone.

Passage Detector - (Motion Detector, Dynamic Detector, Movement Detector) vehicle detector that has the ability to detect the passage of a vehicle

Passage Period - The time allowed for a vehicle to travel at a selected speed from the detector to the nearest point of conflicting traffic.

Passage Time - The time allowed for a vehicle to travel at a given speed from the detector to the nearest point of conflicting traffic.

Progression Analysis and Signal System Evaluation Routine (PASSER) - An automated computer program for calculation of intersection signal timing plans.

Passer II-90 - Arterial timing program that optimizes progression considering various multiphase sequences. Can handle multiphase arterial signal operations.

Passer III-90 - A computer program designed to assist in the analysis of pretimed or traffic-response, fixed sequence signalized diamond interchanges. Runs on IBM-compatible PCs.

Passer IV - A computer program that evolved from MAXBAND. Optimizes signal timing in grid networks, based on maximizing platoon progression.

Path Program - A program for development of ATMS. ATIS, and AVCS evaluation test beds in Orange County and San Francisco Bay areas of California. Organized by CALTRANS and the Institute of Transportation Studies at University of California at Berkeley.

Pattern - See *Timing Plan*.

Pattern Generation - See *Plan Generation*.

Pattern Matching - See *Plan selection*

Pattern Matching - A technique used to select a pattern based on comparing measured traffic data with stored data associated with stored patterns.

Pattern Selection - Choosing one of several patterns from a library of patterns, either manually or automatically, as a function of time-of-day or traffic responsive.

Payment Bond - Bond guaranteeing contractor's payment for materials, equipment, labor and other items associated with the project.

Pedestrian - Any person on foot.

Pedestrian (WALK) Interval - The interval used to initiate the assignment of pedestrian crossing time.

Pedestrian Clearance (DONT WALK) Interval - The interval that provides time for a pedestrian to leave the curb and travel to other curb before opposing vehicles receive a green indicator.

Pedestrian Crossing Detector - Vibrating plate device to indicate right of way for blind and/or deaf pedestrians.

Pedestrian Detector (Push-button) - A pole mounted momentary switch which, when activated by a pedestrian, causes a pulse which notes the demand by a pedestrian for the right-of-way.

Pedestrian Permissive Period - Provides an independent permissive period for ped timing, which usually requires more guaranteed time than the vehicle. See Permissives.

Pedestrian Phase - A traffic phase allocated to pedestrian traffic which may provide a right-of-way indication either concurrently with one or more vehicular phases, or to the exclusion of all vehicular phases.

Pedestrian Recall - With the control activation, pedestrian walk and clearance intervals for the phase are timed once during each cycle without the necessity of a push-button actuation.

Pedestrian Recycle - Any pedestrian service that begins after the associated green phase.

Pedestrian Signal Control - A type of midblock isolated control that is used when pedestrian crossing cannot be accommodated at nearby intersections.

Pedestrian-Actuated Controller Assembly - A controller assembly in which intervals, such as pedestrian WALK and clearance intervals, can be added to or included in the controller cycle by the actuation of a pedestrian detector.

Percentage - Used in lieu of expressing time in seconds since many intervals (which see) are a portion of the total cycle. The total cycle length can be changed due to coordination, 100 percent is used to indicate the total cycle length and the splits and intervals as a percentage of that total.

Percentile Speed - Information obtained from intersection warrants relating to vehicle speeds in an approach. Example: 80th percentile speed: that speed above which 80% and below which 20% of the speeds occurred in the approach.

Performance Bond - Bond guaranteeing contractor's completion of the project.

Peripheral Equipment - Various units or machines that are used mainly for input-output in combination or conjunction with the computer but are not part of the computer itself.

Permissive Period - Relates to selected periods during coordinated operation in which a call from the opposing phase can be acknowledged.

Personal Portable Advanced Traveler Information System (PPATIS) - Hand-held devices that assist travelers with planning and execution of all modes of ground transportation. Functions include communication, database, location, and navigation.

Personalized Public Transit - This user service provides flexibly routed transit vehicles that offer more convenient service to customers.

Phase - The portion of a traffic cycle allocated to any single combination of one or more traffic movements simultaneously receiving the right-of-way during one or more intervals. (See *Traffic Phase*.)

Phase Diagram - A diagram illustrating the sequence of phases at an intersection, with movement arrows indicated for each phase and showing overlaps, concurrent timing, etc.

Phase Modulation (PM) - A technique to transmit information using signal phase. The *carrier* signal has its phase changed in accordance with the information to be transmitted. Can vary the phase of the carrier signal (relative to a constant phase reference signal) to represent binary signal values.

Phase Next (TN) - A controller output, when active, the associated phase is committed to be next in sequence. The output will remain active until the phase becomes active. The TN decision is made at the end of the green interval of the terminating phase.

Phase Omit - See Omit.

Phase Overlap - See Overlap.

Phase Sequence - A predetermined order in which the phases of a cycle occur.

Phase Shift Keying (PSK) - A modulation method employed to transmit data. The technique of differentially coherent phase modulation is generally used as it eliminates the difficulty of deriving a reference phase. In such a system, each signal element is stored one element at a time and the phase change between successive elements provides system coherence and the desired reference.

Pickup Procedures - The orderly processes or operations which are performed to bring a controller assembly under control of the system master.

Pixel - The smallest area on the screen of a graphics CRT display that can be discretely displayed by the system. Pixel is an abbreviation of **Picture Element**. More generally, can be the smallest discrete element of an image.

Plan Generation - The process of computing the traffic parameters forming a timing plan from accumulated traffic data and the area geometry.

Plan Matching - A technique used to select a timing plan based on comparing measured traffic data with stored data associated with a stored timing plan.

Plan Selection - Choosing one of several different timing plans, from a library of timing plans, either manually, or automatically as a function of time-of-day or traffic-responsively.

Plans, Specifications and Cost Estimates (PS&E) - The PS&E are the design documents, hardware/software specifications, and cost estimates suitable for competitive bid.

Platoon - A group of vehicles in motion. Similar to a Queue but differs in that the group of vehicles are in motion. Has become the desired method of establishing coordination — allows a group of vehicles of a certain smooth right-of-way along an artery.

Point Detection - The detection of vehicles as they pass a specific point on the roadway. Detection by pressure and magnetometer detectors are typical examples. Frequently referred to as small-area detection.

Point-to-Point Interconnect - Simple topology where separate links are provided between receiver and transmitters.

Polarity - The sign of the voltage rise from a reference point (usually ground) to a point in a circuit.

Polar Loop - A form of direct-wire linkage wherein the ON/OFF conditions are represented by DC voltages of opposite polarities. (See **DC Multiplexing**.)

Polis - The European ITS field test Promoting Operational Links with Integrated Services through RTI between European cities.

Polling - A centrally controlled technique of sequentially calling a number of drops to permit them to transmit information back to a field master or to the traffic operations center.

Polling cycle - The time period required to poll all of the drops on a channel one time.

Polling System - A communications system that uses a systematic method, centrally controlled for permitting stations on a multipoint circuit to transmit without contending for the interconnect line.

Power Budget - The budget is the difference between the signal power transmitted into the channel and the signal power required for proper operation at the receiver after passing through the physical medium.

Power Fading - Attenuation of an RF signal due to absorption by water vapor causes a power loss at the receiver.

Powerhead Loop Detection - Detector configuration that has increased detection sensitivity for small-vehicles. Uses small internal loops of wire at stopline end of long loops.

Power margin - The difference between the power received and the power required for reception.

Pre-Crash Restraint Deployment - This ITS user service anticipates an imminent collision and activates passenger safety systems before the collision occurs.

Pre-Trip Travel information - The ITS user service that provides information for selecting the best transportation mode, departure time, and route.

Preemption - The transfer of the normal control of signals to a special signal control mode.

Preemption/Priority Systems - Preemption control of normal signal timing plans applies in the following situations: signals adjacent to railroad crossings; emergency vehicle priority movement and priority for transit vehicle. Preemption occurs on a single cycle basis.

Preemptive Devices - Provide priority for fire and emergency vehicles by detecting the vehicle and sending the preemption command to the controller.

Preliminary Traffic Engineering Analysis - An analysis that examines the present traffic situation in detail and identifies the problem to be addressed. Specific factors include: Controlled Area; Operating Characteristics; Transportation Characteristics; Existing System Resources; and System Objective.

Prequalification - The process by which prospective bidders must prove their financial and technical capabilities to implement the proposed system before their bid will be accepted.

Presence Detection - The sensing of a vehicle passing over a detector. True presence is when the pulse duration is equal to the actual time the vehicle remains in the detector field of influence.

Presence Detector - Traffic detector which is able to detect the presence or absence of a vehicle within its field of detection.

Presence Holding Time - The time that a detector system will continue to indicate the presence of a vehicle over one of it's loops without adjusting to consider the vehicle in a new environment. Upon making this adjustment, the actuation is terminated.

Presence Loop Detector - An induction loop detector which is capable of detecting the presence of a standing or moving vehicle in any portion of the effective loop area.

Present worth factor - A coefficient used in engineering economics which relates a uniform series of end of period payments to value of those payments at the present time. Also known as "uniform series present worth factor".

Pressure Detector - A pavement installed device that is activated by vehicle weight.

Pretimed Controller Assembly - A controller assembly for the operation of traffic signals with predetermined fixed cycle length, fixed interval duration, and fixed interval sequence.

Pretimed intersection Control - Assigns right-of-way according to a fixed predetermined schedule.

Preventive Maintenance - Task that includes work done a scheduled intervals to minimize probability of failure.

Polling - See "leased channel."

Probe - (1) The sensor form that is commonly used with a magnetometer-type detector. (2) A vehicle in the traffic stream used for acquiring traffic flow data.

Process Control Computer - A computer whose primary purpose is to provide automation of continuous operations.

Processing gain - In spread spectrum communications, processing gain is a measure of the additional noise penetrability achieved by the use of additional bandwidths and coding schemes.

Processor Storage - A storage device which can hold data and instructions for immediate retrieval by the CPU. Each byte or word of a storage device is directly accessible. (Also called *Memory* or *Internal Storage*.)

Procurement Analysis - Evaluation and selection of procurement options based on specific needs of traffic agency and jurisdictions. Planning is necessary to smoothly transition from old to new control.

Program - A series of instructions or statements, in a form acceptable to a computer, prepared in order to achieve a certain result.

Programmable Read-Only Memory (PROM) - A device that stores data which cannot be alerted by computer instructions. Data is stored (commonly referred to as burned into this device by an external electronic process. Some PROMs can be erased and programmed through special physical processes. (See *EPROM*.)

Progression - A term used to describe the progressive movement of traffic through several intersections within a control system without stopping.

Progressive Network Toning Plans - Control techniques based on establishing a progression timing along key network arterials. Techniques include: Single Alternate; Double Alternate; Quarter-Cycle; and Simultaneous Offset.

Project Evaluation and Review Technique (PERT) - A technique of project management which relates the interdependency of project tasks based on time factors and ensures a timely and coordinate project completion.

Project Management - A management process that transforms a design into an installed system. Uses management tools such as: contract administration; project scheduling; construction management; work breakdown structure; defined and budgeted work packages; project design reviews and audits; and cost/progress status reports. This process carries forward the implementation of the system design. Tasks include: procurement of subsystems and equipment; construction; training; debugging; documentation; acceptance testing; and turnover to user.

Prom (Programmable Read-only Memory) - A device which stores data that cannot be altered by computer instructions. Data is stored "burned" into this device externally by an electronic process. Some PROMs can be erased and programmed through special physical processes.

Prometheus - The Program for European Traffic with Highest Efficiency and Unprecedented Safety is a seven-year European program aimed to make vehicles safer, more economical, and less polluting.

Proprietary Protocol - A communication protocol which is the intellectual property of a communication manufacturer or supplier and which is not available for use by others.

Protected/Protective-Permissive/Permissive - A type of control that provides left-turn phases only when needed. Left-turn phases can be protected or permissive or both when required by intersection conditions.

Protected Ring - Two rings used instead of one, thereby providing two unidirectional transmission paths that may run in opposite directions.

Protocol - A set of communication codes, procedures, and relative timing relationships by which communication is accomplished over a communication channel.

Public Transportation Management - This ITS user service provides for the automatic operation, planning and management function of public transit systems.

Public Transportation Operations - The bundle of ITS user services including: public transportation management; en route transit information; personalized public transit; and public travel security.

Pull Box - A container that is placed underground with a removable cover flush within the ground line. Splices and conduit ends are located here.

Pulse dispersion - See "dispersion."

Pulse Mode - The detector produces a short output pulse when detection occurs. The pulse lasts about 100 ms, even if the vehicle remains in the detection zone for a longer time.

Quadrupole - A loop configuration that adds a longitudinal sawcut along the center of the rectangle, so that the wire can be installed in a figure-8 pattern, thereby producing four electromagnetic poles instead of the normal two. The design improves the sensitivity to small vehicles and also minimizes splashover.

Quarter-Cycle - A progressive timing technique applicable to one-way grids. Adjacent signals offset by one-quarter of cycle length.

Queue - A platoon or group of vehicles waiting at an intersection.

Queue Detector - (1) A vehicle presence detector installed on the entrance ramp just downstream of the frontage road to detect queue spillback onto the frontage road. (2) Component of a traffic control system which senses the presence (or number) of vehicles waiting in a queue.

Queue Length - (1) Number of vehicles stopped in a lane behind the stopline at a traffic signal. (2) Number of vehicles that are stopped or moving in a line where the movement of each vehicle is constrained by that of the lead vehicle.

Radar Detection - A detector capable of sensing the passage of a vehicle through its field of emitted microwave energy.

Radar/Microwave Detectors - Pole-mounted radar device that can sense speed and passage and/or presence, when actuated by a vehicle passing through its RF field.

Radio Broadcast Data System (RBDS) - A commercial standard to implement an RDS system in the United States. Using RBDS, FM stations can transmit data to smart receivers.

Radio Communication - Radio Frequency (RF) transmission using any one of the following techniques: cellular networks; satellite transmission; packet radio; and spread spectrum radio.

Radio Data System (RDS) Traffic Message Channel (TMC) - A traffic information broadcasting system implemented in Europe. RDS provides for the transmission of a silent data channel on existing FM radio stations. It identifies radio data broadcasters and allows self-tuning receivers to automatically select the strongest signal carrying any particular program.

Radio-Frequency Detector - A vehicle detector consisting of a loop of wire embedded in the roadway that is tuned to receive a preselected radio frequency from a transmitter normally located on a vehicle.

Ramp Control - Regulation, warning, or guidance of traffic at points of access to or egress (exit) from a freeway.

Ramp Metering - The most widely used form of freeway traffic control. It regulates the number of vehicles entering the freeway over a given time interval so that demand does not exceed capacity.

Ramp Metering Signal - Traffic signal which directs entrance ramp vehicles to stop and permits them to proceed in accordance with metering rates determined by the type of entrance ramp control being used.

Ramp Storage - The roadway available for storage of vehicles queued and waiting for service at the entrance ramp meter.

Random Access - The process of obtaining information from, or placing information into, storage where the time required for such access is independent of the location of the information.

Random Access Memory (RAM) - A storage device with both read and write capabilities which will allow random access to stored data.

Read-Only Memory (ROM) - A storage device programmed during manufacturing that cannot be changed. Synonymous with nonerasable storage and read-only storage.

Real-Time Clock - A clock which indicates the passage of actual time-of-day rather than a clock set by the computer to measure an arbitrary interval of time.

Real-Time Control - The processing of information or data in a sufficiently rapid manner so that the results of the processing are available in time to control the process being monitored.

Real-Time Operating System (RTOS) - A computer program that controls the operation of a computer so that it performs its control function in a timely manner. (See ***Real-Time Control*** and ***Operating System***.)

Real-Time System (RTS) - A computer system wherein a computation is performed during the actual time that the related physical process occurs, so that results of the computation can be used in controlling the physical process.

Real-Time, Traffic-Responsive Control System - Traffic control system which evaluates and selects control actions continuously on the basis of current measures of traffic conditions.

Recall - An operational mode for an actuated controller unit whereby a phase, either vehicle or pedestrian, is displayed each cycle whether or not demand exists. Usually a temporary or emergency situation.

Receiver - A part of the communications system which accepts and translates (decodes) signals into commands or data functions.

Receiver sensitivity - The minimum optical power required to achieve a specified level of performance, such as a BER.

Recurrent Congestion - A type of congestion which is routinely expected at predictable locations during specific time periods.

Red Clearance interval - Follows the yellow change interval. Both terminating phase and conflicting phase display red.

Red Rest - A feature whereby, in the absence of demand, the controller will return to all red instead of resting ie green of the last serviced phase.

Refraction - The change in direction of an electromagnetic wave resulting from changes in the velocity of propagation of the medium through which it passes.

Regeneration - The process of demodulating and remodulating a digital signal for retransmission.

Register - A data processing device used for the temporary storage of one or more words to facilitate arithmetic, logical, or transfer operations.

Regulatory Signs - Signs that inform motorists of traffic laws and regulations and the applicability of legal requirements.

Relay - An electromagnetic switching device, having multiple electrical contacts, energized by electrical current through its coil. It is used to complete electrical circuits.

Reliability - The quality of a traffic control system to maintain acceptable system operations with minimum system downtime, minimum maintenance cost, and built-in test for equipment failure.

Remedial Hardware Maintenance Task - Task that results from malfunctions and equipment failures. Includes emergency repair activity to restore operation.

Remote Communication Unit (RCU) - A field receiving and field equipment inerface commonly used for traffic system communications. It converts communication signals into signals which are used by field equipment such as controllers and converts detector and controller state data into commuunication signals.

Remote Flash - An input, when energized, causes normal signal operation to be discontinued and specified signal light to be operated in a flashing manner.

Remote Terminal - An input/output device physically removed from the central facility but connected by means of a communication link.

Removable Disk Pack - A set of magnetic disks used in a processing device for reading and writing which can be interchanged with other disk packs. Common to moving head disk units.

Repeat transmission - A communication error detection technique.

Repeater - A device used in a communication channel to amplify and/or reshape signals.

Request for Proposal (RAP) - A written document inviting prospective bidders to submit a project proposal.

Request to Send - A signal from the computer indicating itwants to send data.

Reserved Freeway Lanes - Freeway lanes reserved for HOV use have two configurations: (1) *Concurrent Flow*—Reserve lanes in the same direction as peak flow. (2) *Contraflow*—Reserve lanes on the opposite side of the median where HOV moves against the flow of traffic.

Reset - The action in an intersection controller which causes the control to begin its cycle at a new position in time in relation to reference. Resetting a control assures a desired offset between intersections in a progression system at all times.

Response Services - The types of roadway patrols available for at-the-scene incident response. Includes service patrol, and police patrol.

Responsive Mode - A system operation wherein the selection of signal timing plans is based on current traffic data as input by vehicle and pedestrian detectors.

Rest-In-Red - A controller designed to display red to all movements, in the absence of any traffic demand.

Restrictive Ramp Metering - A form of ramp metering that provides sufficient flow control to maintain non-congested freeway flow.

Reverse Offsets - The technique used for calculation of signal timings when the roadway link is saturated. A reverse progression is implemented in order to clear the downstream queue.

Reversible Lane - A term used to describe a traffic lane upon which the direction of the flow of traffic may be varied during different periods of the day.

Reversible Lane Control - A strategy used to change freeway directional capacities to accommodate peak directional traffic demands. Useful when directional splits are a least 70/30 percent.

Ride Matching and Reservation - The ITS user service that provides real-time ride matching information and reservations to users at their locations.

Right-of-Way - A movement has the right-of-way on a green signal with some legitimacy during the yellow clearance interval.

Ring - An ordered sequencing of mutually exclusive phases.

Road Transport Informatics - The intelligent Transportation System of Europe. Controlled through the Commission of European Communities (CEC).

Road/Automobile Communication System (RACS) - A Japanese driver information project sponsored by the Public Works Research Institute of the Ministry of Construction (MC); Highway Industry Development Organization, and private interests. System consists of vehicles with dead reckoning navigation systems and a roadway network of beacons.

Roadside Radio - Type of driver information system by which messages are conveyed to motorists from local transmitters beside the roadway to radio receivers in their vehicles.

Rodding - Use of a probe to test or clean communication conduits or duct.

Rotating Drum Sign - This sign contains one to four multifaceted rotating drums, each containing two to 6 message faces. Each drum face has one line of a fixed message. The faces can be mixed and matched to form many messages.

Rotating-Tape Sign - A sign which has a number of messages on a tape or film, and which is mechanically capable of selecting and rotating a given message so that it can be viewed. Also referred to as rotating-film, windowshade, or scroll sign. (See *Scroll Sign*.)

Route Guidance - This ITS user service provides motorists with simple instructions on how to best reach their destinations.

Route Preemption - Emergency vehicles have preplanned routes that are incorporated into the signal system Signal control on an emergency basis can be modified a EMS, fire, or police headquarters.

Routine Maintenance - Those work items that must be done regularly to ensure that traffic signal equipment will continue to operate.

RS-232 Interface- Standard interface between data terminal equipment and data communication equipment employing serial binary data interchange.

RT-TRACS (Real Time Traffic Adaptive Control System) - FHWA project to develop a traffic-responsive system control algorithm suitable for an ITS environment by 1997.

Rural ITS - A Minnesota Guidestar project evaluating rural ITS through operational tests; each examines ITS applications m a rural setting.

Safety Readiness - This ITS user service provides warnings about the condition of the driver, the vehicle and the roadway.

Sampling Detector - Any type of vehicle detector used to obtain representative traffic flow information.

Sampling Period - The length of time between each sample of a sensor. (Equal to 1/*Sampling Rate*.)

Sampling Process - The process by which a measurement is made. A measurement is made when a presence detector is sampled to determine its state. The finite time between samples generates an error in pulse duration which propagates into speed and other variables.

Sampling Rate - The rate at which measurements of physical quantities are made. The number of times each second that the computer senses the status of a data sensor such as a loop detector.

Saturated Flow Conditions - A saturated flow condition develops in a network when traffic demand exceeds link capacity for a sustained period. Characterized by long queues that reach between intersections.

Scanning System - A system which senses the status of multiple points, such as detectors, and/or transmits commands to multiple points such as controller units in a predetermined sequence and time schedule.

Scats - A real-time Sydney Coordinated Adaptive Traffic System (SCATS) developed by the Roads and Traffic Authority (RTA) of New South Wales, Australia. it uses two levels of control. Strategic control determines timing plans for areas and sub-areas based on average traffic conditions. Tactical control applies at the individual intersection.

Scheduled Control - A strategy for selecting ramp metering rates as a function of occupancy.

Scoot - A real-time Split, Cycle and Offset Optimization Technique (SCOOT) developed by the Transport and Road Research Laboratory (TRRL) in Great Britain. It computes the cyclic flow profile for every traffic link every four seconds. It projects these profiles downstream using the TRANSYT dispersion model.

Scroll Sign - The scroll sign contains a tape or film rotated to properly position a desired message in the display window. The sign contains a set of stored standard messages.

Search - A software procedure for the examination of a set of items for one or more having a given property.

Serial data transmission - A method of digital data transmission whereby the bits that represent an item of information are transmitted sequentially over a single channel.

Serial port - A portion of a computer, modem, or device which is used to interface the serial communication bit stream with the ftinctional circuitry of the device.

Second-Generation Control (2-GC) - On-line timing plan generation wherein timing plans are updated periodically. This type of control program is based on a background cycle but provides for on-line real-time computation of timing plans. It uses a model to predict near-term changes in traffic demand. These predictions are then used in an optimization program to develop the timing plan.

Secondary Controller Assembly - A controller assembly which operates traffic signals under the supervision of a master controller assembly. (Sometimes called a **Slave**.)

Secondary or Local Controller - See Controller.

Seconds per Actuation (S/A) - An actuated controller setting, associated with variable initial. When a vehicle passes over a detector, a tabulation begins (S/A amount for each actuation), each successive actuation adding to the previous. The S/A amount is compounded until it overrides the MIN green period, and at that point becomes the new MIN green. See Maximum Variable Initial.

Section - A group of signalized intersections which are interconnected and have some time relationship among them.

Self-Powered Vehicle Detection - An in-road detection device, currently in development, that does not require lead-in or interconnecting cables. Uses internal battery and RF link.

Self-tracking Detector - A loop detector unit, not necessarily self-tuning, that includes electronics that compensate for environmental drift.

Self-Tuning Loop Detector Unit - One that is capable of adapting its operation to the resonant frequency of the loop and lead-in wire without any manual adjustment required. The term applies particularly to the startup of the detector's operation, upon turn-on. (Compare **Self-Tracking Detector**.)

Semi-actuated Traffic Controller Assembly - A type of traffic-actuated controller assembly in which means are provided for traffic actuation on one or more, but not all, approaches to an intersection.

Sensitivity - As it relates to a loop system, the change in total induction of a system caused by a minimum vehicle at one loop, expressed as a percentage of the total inductance. As it relates to a detector, is the minimum inductance change in percent required at the input terminals to cause the detector to actuate.

Sensor (System and Local) - Traffic detection devices (detectors) that permit the system master or a local controller to obtain information as to the traffic flow characteristics in the area of the sensor. (See **Detector**.) NEMA limits the meaning of sensor to the sensing element of a detector.

Separated Facilities - Positive separation of HOV and conventional traffic use techniques ranging from buffer lanes without physical barriers to parallel physical barriers.

Sequence - The order in which signal intervals are displayed around an intersection on a pretimed control or with calls all around on an actuated control.

Serial Port Standards - Standards prepared by Electronics Industry Association. Most common is RS 232 with a data rate up to 19200 bits/second. Other standards are RS 422, RS 423, and RS 449.

Serial Transmission - Each bit of the data byte or word is transmitted in sequence over a single channel. Used for long distance where cost is a factor.

Service Patrol - A patrol which provides assistance to those motorists in need of routine aid, such as: fuel; oil; water; tire change; and minor mechanical repairs at the roadside.

Serviceable Conflicting Call - A call which: a) occurs on a conflicting phase not having the right-of-way at the time the call is placed; b) occurs on a conflicting phase which is capable of responding to a call; or c) when occurring on a conflicting phase operating in an occupancy mode, remains present until given its right-of-way.

Setting time - The time required to reverse the direction of transmission in a half duplex system.

Shield - A conductive material surrounding the pair of lead-in wires of a loop-detector installation, so that outside lectrical interference will not induce noise onto them.

Shock Wave - Boundary, moving upstream of an incident, between the region of traffic flow affected by the incident and that region of traffic flow not affected by the incident (i.e., congested versus non-congested).

Shuttered Fiber Optic Signs - These signs are constructed of fiber optic cable bundles and guide light energy from a point source to pixels on the sign face. Pixel shutters mounted behind the sign face control emission of light from each pixel. Proper shuttering controls the formation of characters.

Sign Controllers - Sign controllers monitor and control the sign display elements. Types of control are: remote automatic; on-site automatic; remote manual; on-site manual; fixed-time automatic; fixed time remote manual; and fixed-time on-site manual.

Signal - An optical device which is electrically operated by a controller and visually communicates a prescribed action or actions to traffic.

Signal Control Strategy - The method of controlling an intersection so as to enhance the flow of traffic. Examples of control strategies are pretimed and actuated control. (Also *see Actuated Controller Assembly, Pretimed Controller Assembly*, and *Full-Actuated Controller Assembly*.)

Signal Indication - The illumination of a signal lens (or an equivalent device) whereby the movement of vehicular or pedestrian traffic is controlled.

Signal Modulation - Transforms the signal into a form suitable for the transmission system and media. Binary data requires two types of modulated signals.

Signal Priority Systems - Priority control at signalized intersections are typically used for reduction of transit delay. Conditional signal priority for transit vehicles can be implemented through: phase/ green extension; phase early start or red truncation; red interrupt or special phase; phase suppression or skipping; and window stretching.

Signal Timing - The amount of time allocated to each interval/function in a signal cycle.

Signal Timing Plan Priority - Signal timing plans can be generated that favor minimization of transit vehicle delay. For example, TRANSYT incorporates this feature in its optimization routine.

Signal-Related Special Control - Categories of control that include: HOV priority systems; preemption/priority systems; directional lame control; television control monitoring; and overheight vehicle control systems.

Signal-to-Noise Ratio (SNR) - A measure of the quality of a communications channel that relates the receiving signal strength to the strength of the unwanted signals (noise) that combine with the desired signal during transmission.

Simplex Channel - A one-way communications channel. One end of the channel is always the transmitter and the other end is always the receiver.

Simulation - A pseudo-experimental analysis of a system by means of mathematical or physical models that operates in a time-sequential manner similar to the system itself.

Simultaneous- Coordination method whereby all signals along an artery give the same indications to given street at the same time.

Simultaneous Gap-Out Inhibit - A feature that disallows a phase's passage timer from starting up again once it has timed out.

Simultaneous Offsets - A progressive timing technique used for long cycle lengths and congested conditions. All signals on the major street turn green at same time.

Single Alternate - A progressive timing technique based on alternating half-cycle offsets at each intersection.

Single Entry - A fully-actuated operating mode in a dual-ring in which a phase in one ring can be selected and timed alone when there is no demand for service in a non-conflicting phase or a parallel ring.

Single mode fiber - An optical fiber that supports only one mode of light propagation.

Single Point Freeway Interchange Operation - A freeway interchange controller design that provides a basic six movement operation. Useful when the distance between ramp connections (frontage roads) are between 250 and 400 ft (400 and 650 km).

Single Entry Metering - Method of entrance ramp control which permits only one vehicle to enter the freeway per ramp metering signal cycle.

Single-Message Sign - Sign which is capable of transmitting only one message to the driver.

Single-Reset System - Reset system of direct interconnection of local controller units which provides only one offset.

Single-Ring Controller Unit - A controller unit that contains two to four sequentially timed and individually selected conflicting phases arranged to occur in an established order.

Sinusoidal - A waveform having the shape of the mathematically defined sine wave. This wave shape is commonly used in defining frequency-related parameters in communications systems.

Skip Phasing - The ability of a controller unit to omit a phase in the absence of demand on that phase or as directed by a master control.

Slotted Aloha - A contention technique channel access control scheme.

Slow Scan video - See "Freeze frame video."

Slow-Vehicle Detector - Component of a merge control system which senses the presence of a slow-moving vehicle on the entrance ramp between the ramp metering signal and the merge detector.

Small-Area Point Detector - A detector intended to detect vehicles at a spot location upstream of the stopline. They may detect more than one lane. The 6 ft (1.8 m) loop detector is a prominent example. Also, included are ultrasonic and radar units, whose detection areas may be as long as 20 to 30 ft (6 to 9 m), because the length of time the moving vehicle is in the detection zone is not used in the intersection control logic.

Small Scale Integration (SSI) - In integrated circuitry, a chip with fewer than 100 logic elements.

Small-Area Detectors - Devices that detect vehicle passage at spot locations. Also called short-loop, point or passage detectors.

Smart Corridor System - In example of an integrated Traffic Management System (ITMS) for a major traffic corridor located in Southern California between Santa Monica and downtown Los Angeles. It is 14 miles (22.5 kilometers) long and contains the Santa Monica Freeway and five arterials. Implemented by CALTRANS.

Smoothed Data Value - A point or value representing the trend of discrete data. This value is found by using a filtering equation which is an iterative process. (Also see ***Filtering Equation***.)

Smoothing Filter - A sampled data filter that operates on the time series of data samples to extract the non-random trend component.

Society of Automotive Engineers (SAE) - This organization plays a leading role in development of ITS standards, in particular the vehicle and vehicle interface. Serves as Secretariat for the ISO technical committee 204.

Socrates - The European ITS field test for the System of Cellular Radio for Traffic Efficiency and Safety.

Soft Recall - A form of "extendable recall" except the phase in only served if no other "real calls" exist. Real calls are those for which there is a detector input actuation.

Software - Various computer programs to facilitate the efficient operation of the system. Software items include: assemblers; generators; subroutines; libraries; compilers; operating systems; and application programs.

Software Generations - A family of software routines related to each other in that each generation is a modification/upgrade of the preceding routine. All generations have the same name and are distinguished from each other by their generation numbers (first, second, third) and their successive dates of creation.

Software Maintenance - Those tasks required to correct errors remaining in computer programs after they are placed in operation, as well as making other program modifications to meet the demands of changing system needs.

Sonic Detector (Active) - Pole-mounted device that transmits/receives ultrasonic pulses to provide vehicle presence.

Sonic Detector (Passive) - Mounted acoustic device that listens to vehicle generated noise to establish presence and passage. May provide vehicle type based on noise spectrum.

Source Program - A program written in a non-machine language such as FORTRAN or C. The program becomes the input to a language translator.

Space Mean Speed - The average of speeds of vehicles within a given space or section of roadway at a given instant; also, average speed of a specified group of vehicles based on their average travel time over a section of roadway.

Special Conditions - That portion of the contract documents which provides further explanation of general conditions or relates a general condition to a specific requirement associated with a project.

Special Event Plan - A timing plan stored in memory which is activated to compensate for unusual traffic flow caused by a special event (such as a football game).

Specialized Intersection Control - Categories of control that include isolated intersection control; arterial intersection control; closed network (CBD) control; and areawide system control.

Specifications - Written documents describing minimum requirements for items of work, materials, equipment, etc.

Speed - Distance traveled by a vehicle per unit time.

Speed Trap - Two or more detectors strategically positioned and spaced, to permit the computation of vehicle speed by measuring the time between actuations as a vehicle passes from one sensor to the next.

Splashover - An unwanted actuation caused by a vehicle in a lane adjacent to that in which the detector is located.

Splice - An interconnection method for joining the ends of communication cables.

Split - The percentage of a cycle length allocated to each of the various phases in a single cycle.

Split Selection - The process by which a split is selected or calculated by the computer based on a measurement and comparison of directional demand as detected by system sensors or predetermined by time-of-day clock.

Spread Spectrum Radio - A technique that spreads the signal over a wide frequency range at the transmitter, then compresses to original frequency at the receiver. Used in conjunction with code division multiplexing, separate channels do not require unique transmitter and receiver modules. Can transmit data and compressed video.

Standby Mode - An operational status of a local controller assembly or system which is not under central computer control but is capable of responding to central computer control.

Standby System - Local control components which operate the intersection signals upon failure of the communication link to the computer or when the intersection is in standby mode.

Standby Transition - The act of changing to or from a standby mode. (See ***Drop Procedures and Pickup Procedures***.)

Start bit - A flow control bit forming a portion of the communication protocol.

Starting Delay - A delay experienced in initiating the movement of queued traffic from a stop to a maximum flow rate through a signalized intersection.

Startup Assistance - A contractor support service to assist the operating agency bring the system on-line. includes supply of initial spares and repair of equipment and renewing operational proficiency.

Statewide Signal Optimization Squad (SSOS) - A North Carolina traffic signal improvement program.

Static Signs - A single message is conveyed by a static sign. They are most useful a road locations where the same driver response is desired all the time.

Stop bit - A flow control bit forming a portion of the communication protocol.

Stops - The number of vehicles that stop. Used as a measure of effectiveness to assess the effectiveness of a timing pattern. A computer controlled system goal is to minimize stops.

Stop Training - Provision within a controller to suspend timing operations upon assertion of an external command.

Storage Area - The area, usually expressed in terms of the number of vehicles, between the stop line and the detector located upstream. In pretimed control it may be the number of vehicles arbitrarily used to determine green time.

Store - The procedure by which one or more bytes of data are transferred from the CPU to processor storage.

Stored Plan - A timing plan in computer storage (memory).

Strategic Plans - Approaches that use predetermined timing plans and then call them into use by time-of-day or traffic-responsively as measured by traffic detectors. (Contrasted with **Tactical**.)

Street Equipment - That equipment or hardware which is located **on the street**, such as an intersection controller assembly, signal heads, and detectors.

Stretch Detector (Extended Call Detector) - A detector with a carryover output. It holds or stretches the call of a vehicle for a period of seconds that has been set on an adjustable timer incorporate into the detector. It can be designed to begin the timing of that period when the vehicle enters the detection area, or when it leaves. The latter option is more common.

Submaster Controller Assembly - A controller assembly which receives commands from a master controller assembly and effects changes in timing plans to secondary controller assemblies.

Subnetwork - Subdivision of a section.

Subnetwork control - A control technique in which a signal system consisting of numerous signalized intersections is subdivided into two or more subnetworks for control purposes.

Subroutine - (1) The sequence of machine instructions that complete a defined function or program. (2) A program that defines desired operations and which may be included in another program to produce the desired operations.

Subroutine Library - A collection of subroutines.

Super Smart Vehicle System (SSVS) - The Japanese project developing systems to assist drivers with automated lateral control, in-vehicle display of vehicle and traffic flow, active roadside lighting, and in-vehicle dynamic signing.

Supervisor - Software routine that controls and schedules the other software routines.

Supervisory Local Controller - A control device ranging from a time-base coordination unit to a remote master controller that determines or alters interval duration and/or maintains timing relationships in a group of local controllers.

Supply Strategies - The TSM strategies that focus on changing the quality of vehicular flow. Supply actions include: arterial signal coordination; incident management; parking prohibition; and turn controls.

Surveillance - The monitoring of traffic performance and control system operation.

Symbol - A single unit communication transmission format.

Sync Pulse - A pulse generated from a central point that provides a common time-base to all coordinated traffic controller units and which is used to provide a smooth flow of traffic through coordinated intersections.

Synchronization - In communications, the process by which a transmitter and a receiver coordinate their operation so as to properly identify the bits and characters that make up a digitally transmitted message.

Synchronous Controller Unit - A controller unit in which the timing mechanism is controlled by and dependent on a suitable frequency standard such as the frequency of the alternating-current source.

Synchronous Transmission - The data characters are transmitted at a fixed rate, with transmitter and receiver synchronized with no start or stop bits. Timing is derived through synchronizing characters at the beginning of each message or block of data. This technique is a more efficient transfer.

System - An array of components (hardware, software, interfaces) designed to achieve specific transportation objectives.

System Acceptance Tests - A contractor support service to develop, conduct and sign off on successful completion of the test plan. Acceptance testing includes: equipment checkout tests; system electrical tests; computer software tests; subsystem operations tests; and final system acceptance tests.

System Feasibility Study - The study that establishes the concept or preliminary design of a traffic system. It establishes the framework for detailed design and specifications for both the system and communication network. It also discusses capital, maintenance and operating costs, and staffing requirements.

System Implementation - Implementation of a traffic system includes the following phases: System Feasibility Study; Generation of Plans, Specifications and Cost Estimates (PS&E); and System Procurement, Installation and Acceptance Test.

System Management - A deliverable service by a contractor to direct, coordinate, review, monitor, and control the system design and implementation.

System Manager Approach - This approach uses a prime contractor to be responsible under an engineering services contract for: system design; PS&E preparation; system integration; documentation; and training. The system manager does not supply the system hardware or software components. Separate contractors provide these items.

System Modifications and Updates - Operations task that determines the need for system upgrades. Upgrades could include: control strategy and timing plans; operating and control software; and new control features and system capabilities (i.e. , ATIS, ETTM, AVI).

System Monitoring/Intervention - Operations task to verify proper operation of traffic field equipment and when necessary manually override signal timing and metering plans.

System Performance Evaluation - The determination of the relative merits of system improvements.

System Selection Process - The specific decision process that leads to a rational selection of a traffic system. The four sequential steps with feedback are: define system requirements; identify alternative systems; evaluate alternative systems; and select desired approach.

System Shutdown - (1) Emergency system shutdown involves the fail-safe turning off of some or all system components due to power failure or equipment failures. (2) Planned system shutdown consists of turning off some or all system components by manual or automatic means, usually for maintenance or off-line tasks.

System Speed (or Average Overall Travel Speed) - The ratio of total travel to total travel time.

System Staffing - The organization required to operate and maintain the system. Staff skills include knowledge of traffic operations, systems integration, equipment maintenance, and repair.

System Start Up Analysis - System start up concerns the planning necessary to smoothly transition from old to new control. It includes traffic management during construction, timing plans, database preparations, and acceptance testing.

System Status - A display or printout of the operational condition of each monitored unit in the system.

Systems Approach - The process or combination of tasks that ends in the operation of a traffic system. In developing a traffic control system, these tasks include problem identification, feasibility analysis, system evaluation and selection, system design, installation, operation, and maintenance.

TI (system) - A standard digital signal transmission hierarchy which permits signals to be sent at the various rates described in the standard.

Table - An array of data each item of which may be unambiguously identified by one or more subscripts.

Tap - A signal splitting device which permits a small amount of power to be siphoned from a communication line for use at a local drop point.

Tariff - The published rate for a particular commercial service of a common carrier.

TBR (Time Before Reduction) - During the process of GAP REDUCTION, it is the time period before the Gap reduction process takes place.

TDM - See Time Division Multiplexing.

Technical Specifications - The document that describes the specific requirements for material, equipment, installation, test, and operation of the planned system.

Telco Central Office - A location which terminates communication lines to customers. A switched or leased line is routed from the customers facility to a central office. Connections are made between central offices before the line is routed to its destination.

Telemarketing Call-In System - One type of driver information system which provides traffic information upon request via telephone to be used for pretrip planning.

Telemetry - The automatic transmission of data over long distances.

Terminate - Applies most frequently in traffic control to the end of a timing interval. Termination of right-of-way begins in an active phase when a call is received from an inactive phase in a full actuated control; right-of-way termination must always include adequate intervals.

Terrestrial Microwave Links - Microwave links provide point-to-point (line-of-sight) between transmitting and receiving antennas. In traffic control used for trunk lines carrying both voice and data. Requires FCC license. Can transmit voice, data, and compressed video.

Texas Traffic Light Synchronization Program - A Texas traffic signal improvement program that has demonstrated through reductions in fuel consumption, delay, and stops, the benefits of applying signal optimization on an intersection and network basis.

Thermal Noise - Thermal agitation of electrons in the load resistance of the receiver.

Third-Generation Control (3-GC) - On-line timing-plan generation wherein timing plans are updated on a cycle-by-cycle basis or some comparable time frequency. The requirement for a constant or background cycle is eliminated. Generally discarded concept. Replaced by adaptive systems. (See RT-TRACS.)

This Phase Next (TN) - See Phase Next.

Threshold - A present level or value of a parameter which indicates that a change of activity will occur if the current value is above or below this level.

Through-Band - The area between a pair of parallel speed lines which delineate a progressive movement on a time-space diagram.

Through Movement - A movement at an intersection which continues in a straight line and across the intersection; does not turn in any direction.

Throughput - A MOE expressed in terms of Total Travel divided by Total Travel Time for a given set of traffic conditions with a given time interval. Throughput connotes traffic being put in a one end and taken out the other.

True Base Coordidnation - Coordinated operation in response to internally generated time clock commands selecting cycle, split, and offset.

Time Clock - A device for the automatic selection of modes of operation of traffic signals in a manner prescribed by a predetermined time schedule.

Time Division Multiplexing (TDM) - This technique sends a number of signals over a single channel by time, dividing the channel into a number of time slots and assigning each signal its own time slot.

Time Headway - The time separation between vehicles approaching an intersection, measured from front of vehicle to front of vehicle.

Time Mean Speed - The average of speeds of all vehicles or a specified class of vehicles at a specific point on a roadway during a specified period of time; also called average spot speed.

Time Share - The use of a device for two or more purposes during the same overall time interval, accomplished by interspersing component actions in time.

Time-Base Signal Coordination - A controller coordination technique that changes timing plans on an internal time basis.

Time-Based Coordination (TBC) Control - TBC control permits system operation of pretimed and traffic actuated local controllers without communication links or master control units. TBC can be implemented in all NEMA TS2 and Model 170 controllers, and some TS1 controllers.

Time-of-Day Operation (TOD) - Signal timing plans selected according to time-of-day.

Time-of-Day Patterns - Signal timing plans selected according to the time of day.

Time-Space Diagram - A graphical technique for calculating the progressive signal timing pattern based on street geometrics and traffic flow variables. The timing pattern is defined by green band, band speed, and bandwidth.

Time Zero - The reference point used in coordinated systems to identify offsets along an artery.

Timer - The timing unit in a controller cabinet. Most often referred to as the controller.

Timing Key - The device placed in a dial unit to effect a change in signal indication or check for coordination.

Timing Plan - A set of cycle length, splits, and offsets within a section of signals. The particular timing for each intersection may vary with time-of-day within the plan.

Timing Plan Elements - The components of a timing plan that include cycle length, splits, and offsets.

Timing Strategy - Procedure used to determine signal timing.

Total Travel - A MOE expressed in vehicle-miles (kilometers). It is the product of the total number of vehicles using the roadway during a given time interval and average trip length of vehicles.

Total Travel Time - A MOE expressed m vehicle-hours. it is the product of total number of vehicles using a roadway during a given time interval and the average vehicle travel time.

Trace Routine - A routine that provides a historical record of specified events in the execution of a program. Used primarily in debugging programs.

TRAF-NETSIM - This microscopic network simulation program is an interval-based, microscopic stochastic computer model that simulates the operational performance of a signalized network. Model based on UTCS-1 traffic control model employing car-following logic.

Traffic Actuated Intersection Control - Assigns right-of-way and determines cycle length and phase, based on detection of traffic on the various approaches.

Traffic Adjusted - Term used in master supervisory systems where vehicle actuations and other data are fed to the master for effecting signalization changes at several intersections rather than at each intersection independently.

Traffic Control - Regulation, warning, and guidance of traffic for the purpose of improving the safety and efficiency of traffic flow. This ITS user service manages the movement of traffic on streets and highways.

Traffic Control System Benefits - The improvements that result from use of a traffic control system. includes reduction in accidents, travel time, delay, stops and increases in average speeds and flows. These in turn reduce fuel consumption, vehicle emissions, and user costs.

Traffic Control Systems Handbook - The handbook published by Federal Highway Administration to present basic technology used in planning, designing and implementing traffic monitoring and control systems for urban street and freeway applications. Currently in its third edition (1996), it is a compendium of applicable technology, concepts and practice in the traffic control field.

Traffic Control Variables - Control variables are measurements of certain parameters that describe traffic conditions. Variables commonly used for street control are: vehicle presence; flow rate; occupancy; density; speed; headway; and queue length.

Traffic Corridor - A system of roadways that consists of a major limited access highway, parallel arterials and crossing highways, and surface streets.

Traffic Data Components - A time series of traffic data consists of two components, non-random and random. The random component records non-deterministic variations in data value from cycle to cycle. The non-random component records deterministic variations in basic service demand.

Traffic Delay - A MOE expressed in hours. On roadways it is defined as the increase in travel time beyond a value corresponding to a baseline speed. For intersections, it is defined as the time lost by the stopped vehicles.

Traffic Detector - (1) A device located m or near the roadway, which is acted upon directly by a vehicle to create a usable pulse to an intersection control device. (2) A device that can be used singly or in combination to measure traffic variables such as presence, volume, speed, and occupancy.

Traffic Generators/Attractors - Major activity centers, such as parking garages, shopping centers, etc., which generate or attract traffic.

Traffic Maintenance Management - An effective maintenance program includes: accurate record keeping; configuration; and documentation of timing plans; database; and equipment/software manuals. Daily updating is required.

Traffic Management and Control Structure - Traffic systems operate as closed-loop feedback processes. Basic functions to be performed are: traffic monitoring; decision-making control execution; and performance verification and evaluation.

Traffic Management System - Operates as a real-time system that produces, within boundaries, a consistent, efficient allocation of traffic resources to service roadway traffic and motorist traveler demands.

Traffic Network Study Tool (TRANSYT) - A widely used and accepted off-line optimization program for signal network timing plan generation. Developed by the United Kingdom Transport and Road Research Laboratory (TRRL). It can both evaluate existing timing and optimize new plans. Uses a platoon dispersion model. Widely used in the United States.

Traffic Operations - The response to existing and anticipated future traffic demands and incidents.

Traffic Operations Center (TOC) - A TOC is the central facility for the control, monitoring and management of the traffic signal, freeway and corridor control systems within its jurisdiction. A TOC consists of an operations room, computer and communications room, maintenance room, CCTV, large screen map displays, and workstations.

Traffic Operations Routine - Traffic operations require tasks be performed on a daily basis. These include: maintain daily control log; maintain event log: maintain ledger of tuning plan modifications; daily summary reports of traffic conditions; maintain integrity of system databases and software; and maintain daily log of equipment failures and system operating status.

Traffic Phase - Those right-of-way, change, and clearance intervals in a cycle assigned to any independent movement(s) of traffic.

Traffic Responsive - Integrated (Freeway Ramps) - A strategy based on real-time measurements, determination of freeway section operating point, and determination of maximum ramp metering rates for uncontested conditions

Traffic Responsive - Isolated (Freeway Ramps) - A strategy based on selecting metering rates on basis of real-time measurements, usually occupancy based.

Traffic-Responsive Signal Control - The feature of an open- or closed-loop field master controller that changes intersection signal timing based on information from system detectors.

Traffic Responsive System - A system in which a master controller specifies cycle/split/offset on the real-time demands of traffic as sensed by vehicle detectors.

Traffic Signal Phases - Traffic phases reduce conflicts between traffic movements at signalized intersections.

Traffic Signal Systems - Traffic systems that control a group of arterials or surface street networks through coordinated traffic signals. There are two types of traffic signal systems: arterial and closed grid network systems.

Traffic Signal Timing Variables - Variables that control the phasing at a traffic signal. Include cycle length, phase interval, split, and offset.

Traffic Simulation (Corridors) - The modeling of a traffic freeway, network, and signal system to predict performance of the system. Classes of Traffic simulation models are the FREQ model; the FRESIM model; the INTEGRATION; the MACK; and FREFLO models.

Traffic System Evaluation - Evaluation assesses performance levels of the operations and maintenance functions. Includes effects on safety and flow quality of new systems, and control strategies. Before and after MOEs are required.

Traffic-Responsive System - A system in which a master controller either selects or computes signal timing based on the real-time demands of traffic as sensed by vehicle detectors.

Training - A deliverable service of courses and instructions to train the system operators and staff. Includes operation and maintenance courses.

Transceiver - A communications device used both to transmit and receive information. A transmitter and receiver on common chassis.

Transducer - A device that is actuated by power from one system, and that supplies power in any other form to a second system.

Transfer Rate - The speed at which data may be read from or written to the device.

Transition - The process whereby the system master and the local intersection controller units change from one program to another.

Transmission - The electrical transfer of a signal, message, or data from one point to another.

Transmission Modes - The direction of data over a channel. Simplex is flow in one direction only. Half-duplex is flow in either direction sequentially. Full duplex is flow in each direction simultaneously.

Transmitter - A part of the communication system which provides the transmission signal power to the modulated waveform.

Transportable Signs - A transportable CMS displays real-time information at any location where predictable special events will occur and to manage traffic when unpredictable major incidents occur. Mobility provides for end of queue management. They can be mounted on trucks or trailers.

Transportation Improvement Programs - The programs developed by Metropolitan Planning Organizations (MPOs) to implement the goals of ISTEA and ITS Strategic Plan.

Transportation Systems Management (TSM) - A philosophy for planning, programming, implementing, and operating, that focuses on improving the efficiency and effectiveness of the transportation system.

Transyt - An off-line traffic signal timing optimization program developed in England.

Transyt-7F - An Americanized form of the original program, TRANSYT-7F was developed under Federal Highway Administration sponsorship.

TravTek - A state-of-the-art example of ADIS system. Operational field test conducted in Orlando, FL with 100 rental vehicles.

Travel and Transportation Management - The bundle of user services including: en route driver information; route guidance; traveler service information; traffic control; incident management; emissions testing; and mitigation.

Travel Demand Management - The bundle of ITS user services including: pre-trip travel information; ride matching and reservation; and demand management and operations.

Traveler Information Systems - Systems including both hardware and software that advise motorists of roadway conditions so that the motorist can take appropriate action to respond to the condition. Providing the motorist with this information enhances the efficiency and safety of traffic operations.

Traveler Services Information - This ITS user service provides a business directory or *yellow pages* of traveler/motorist related services.

Travelink - A Minnesota Guidestar project evaluating effectiveness of enhanced transit information directed to commuter mode choice and HOV travel.

Triple-Reset System - Reset system of direct interconnection of local controller units which provides three offsets.

TRRL - The Transportation Road Research Laboratory. It is the equivalent of FHWA in Great Britain. It developed the SCOOT computer based traffic control system. This system implemented the concept of adaptive control.

Truth Table - A mathematical concept which can be used to represent the relationship between events. Shows the result of a given logical expression for some combination of input values.

TTR (Time to Reduce) - During the process of Gap Reduction, it is the total time period for the reduction process to take place.

Turbulent Flow - See *Unstable flow*.

Turnaround time - See "settling time."

Twisted Wire Pairs - Cable is provided in standard pair quantities: 6, 12, 18, 25, 50, 75, 100, 150, 200, 300, 400, 600, 1,200 and in wire gauges 19, 22, 24 and 26 AWG. Twisted pairs reduce electrical interference by cancellation.

Two-Abreast Metering - A form of platoon metering which releases two vehicles side by side per ramp metering signal cycle.

Two-Step Procurement - This approach uses a prequalification of the competing contractors in order to ensure only qualified contractors bid the second step, project installation.

Ultrasonic Detector - Ultrasonic detectors use the same principle as the microwave detectors — a transducer transmits a beam of energy into an area and receives a reflected beam from a vehicle. The sonic detector transmits pulses of ultrasonic energy (20 to 50 kHz at 20 to 25 times/sec) through a transducer. The passage of a vehicle causes a beam to be reflected to the transducer at a different frequency. The transducer senses the change in frequency and converts it to electrical energy. This energy is relayed to a transceiver, which then sends an impulse to the controller unit to denote passage of a vehicle.

Ultra Violet Erasable Programmable Read Only Memory (UVEPROM) - An EPROM that is erased and repro-grammed using ultra violet light.

Unconditioned Line - A voice-grade private line data channel (such as the 3002-type channel) without compensa-tion to minimize attenuation in the audiofrequency band. (See *Voice-Grade Line*.)

Universal Traffic Management Society (UTMS) - Organization sponsored by Japanese National Police, coordinates development of a new Traffic Management System.

Unstable Flow - The operating condition where a small increase in demand (flow) can be expected to be accompanied by a large decrease in speed leading to high densities and internal friction. This type of high density operation cannot persist, and it leads inevitably to congested flow.

Updating System Timing - Operations task to determine new timing plans and strategies. Requires extensive field data collection and use of PC-based signal timing optimization programs (i.e., PASSER and TRANSYT).

Upstream - The roadway portion which is positioned toward the source of approaching traffic from the point of reference.

Upstream Occupancy Control - A ramp metering control strategy that was real-time occupancy measurements taken upstream of the entrance ramp, to select a metering rate for the next control period.

Urban Traffic Control System (UTCS) - A widely deployed real-time traffic responsive control system originally developed by the Federal Highway Administration (FHWA) and prototyped in the Washington, DC network. Uses a signature matching algorithm to select a timing plan that minimizes matching error. The architecture of these systems has changed over the years to accommodate newer technologies including local area networks, open architecture computer and communication equipment and microprocessors with real-time operating systems at the intersections.

Urban Traffic Control System (UTCS) Project - A milestone m the development of computer-controlled traffic control systems. Sponsored by FHWA, it was installed in Washington, DC. Completed in 1972, it contained 512 vehicle detectors and controlled signal timing at 113 intersections. it supported extensive traffic control research.

User Service Bundles - A collection of ITS user services that have common characteristics and can be deployed in a coordinated manner.

UTCS 1-1/2 Generation Control - An enhancement to the original UTCS that incorporates an automatic timing plan generator. The generator uses data collected by the system, provides off-line analysis and synthesis, and automated loading of new plans into the traffic system.

UTCS Software - Two software packages that add new functions to the original software product. Termed Extended and Enhanced software, they provide features including: NEMO controller interfaces; improved database management; signal feedback; and display capabilities.

Utility Measure - A proxy value used as a measure of the benefit, or utility, of a traffic control system.

Utility-Cost Analysis - A specific evaluation technique that assigns a relative ranking to each requirement and a rating as to how well a system satisfies that requirement. The utility value for that system with respect to that requirement is the multiplication of these factors. The sum across all requirements is the system utility. The Utility-Cost factor is formed when Utility is divided by system cost including design, installation, and O & M costs. Analyzes the ability of a traffic control system to perform its function in comparison to it's cost.

Variable Initial Interval - A controller unit design feature which adjusts the duration of initial interval for the number of vehicles in the queue.

Variable Speed Limit Signs - Signs often used by turnpikes and other toll facilities, warning motorists to reduce speed due to weather conditions, construction, and incident management.

Variable-Sequence Phasing - The control option that changes the sequence of phases on a cycle-to cycle basis.

Variable-Speed Control - Concept of mainline control which limits the speed of traffic on a freeway in accordance with prevailing traffic conditions.

Vehicle Detector System - A system for indicating the presence or passage of vehicle. (See *Detector System*.)

Vehicle Display - Equipment for displaying information to drivers mounted within the vehicle.

Vehicle Extension - The amount of time, in seconds, that a green interval is extended for each vehicle actuation on a traffic-actuated controller assembly.

Vehicle Information and Control Systems (VICS) - The Japanese project that combines the best of RACS and AMTICS. Proposed to include a digital microcellular radio system that provides two-way data road vehicle communications and location information.

Vehicle Intersection Delay - The vehicle delay that results from stopped time delay (time waiting during red) and total delay (stopped time delay plus stop and startup delay).

Vehicle Location Technologies - Technologies used with ADIS and ATIS systems that provide vehicle location referenced to a geographical coordinate system. Technologies include: dead reckoning; global positioning systems; map matching; digital map; and proximity beacons.

Vehicle or Pedestrian Recall - A feature on a traffic-actuated controller unit which will allow the selection of any phase to which the unit will automatically return after it has served the other phases.

Vehicle Presence - Presence or absence of a vehicle at a post on the roadway.

Vehicle Road and Traffic Intelligence Society (VERTIS) - The Japanese ITS organization organized by government to promote cooperation between public and private organizations and provide liaison to foreign ITS organizations.

Vehicle/Road intelligence (VeRI) - Organization sponsored by Japanese Society of Automotive Engineers to promote cooperation with other Japanese ITS groups.

Verify - To determine whether a transcription of data or other operation has been accomplished accurately.

Versa Module Eurocard (VME) - A standardized bus back plane.

Vertical Antenna HAR Systems - A HAR system that uses a whip antenna or several antennas spaced along the highway and electronically interconnected. The signal radiates in all directions, forming a circular transmission zone.

Very Large Scale Integration (VLSI) - In integrated circuitry, a silicon chip with 100,000 or more logic elements.

Video Display Terminal - Used by some manufacturers to designate the combination of the CRT display with a keyboard.

Video Image Processing System - Mounted video camera device with associated processing hardware and imaging software to provide speed, presence, and passage measurement. Can be used for wide-area detection.

Vision Enhancement for Crash Avoidance - The ITS user service that improves the driver's ability to see the roadway and objects on or along the roadway.

Voice-Grade Lines - A channel suitable for transmission of speech, digital, or analog data, or facsimile, generally with a frequency range of about 300 - 3,000 Hz.

Volatile Memory - A storage medium in which information is destroyed when power is removed.

Volume - The number of vehicles passing a given point per unit of time.

Volume-Density Controller Unit - A type of actuated controller unit which has added initial and gap-reduction timing features.

Warnign, Advanced - See Advanced Warning.

Warning Signs - Signs that inform motorists of existing or potentially /hazardous conditions on or near the roadway.

Warrants - The results of actual surveys made at an intersection to determine if signalization is needed or requires change. Refer to Uniform Manual for suggested methods and determining factors.

Webster Delay Equation - The mathematical expression for average delay per vehicle at an isolated intersection approach based on signal settings and traffic variables.

Week Program - A program used to determine the time of operation according to a weekly schedule which may be preset to vary from day to day.

Weighted Sensor Data - A channel having a bandwidth greater than that of a voice-grade channel. Wideband channels having bandwidths from 50,000 Hz to over one million Hz (a video channel) are available.

Which - An automated computer program for calculation of intersection signal timing plans for either pretimed or actuated signals.

Word - A group of consecutive bits which occupy one processor memory location and most frequently (but not always) are used in a standard computer instruction or operand.

Word Length - (1) The number of bits in a computer word. In a given computer, the number may be constant or variable. (2) The number of usable storage bits in a computer word.

Yellow Change interval - The interval following green that alerts motorists to imminent phase termination.

Yield (YLD) - A command which permits transfer of the right-of-way.

Yield Controller Command - Is used to de-energize the hold command and begin the termination of the active phase.